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Index issue

Biophysics, Bioengineering and Medical Instrumentation

Section 27
Abstracts no 2941-3339

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1. GENERAL ASPECTS

1.2. Components

2941. The light response characteristics of the one electron FEU-64 and FEU-79 photomultipliers - Reznikov I.V. - SOV.J.OPT.TECHNOL. 1973 40/10 (656-657)

A method is described to measure the light response characteristics of the photomultipliers FEU 64 and FEU 79, operating in the one electron mode.

2942. TTL program controller with PROM - TTL PROGRAMMSCHALTWERK MIT PROM - Timm V. - Inst. Datenverarbeit. Anlagen, TU, Braunschweig - ELEKTRONIK 1975 24/1 (53-58)

This essay describes a high speed bipolar program controller of simple design which can be realized at relatively low cost by the use of TTL circuits. The program can also be altered easily and rapidly since programmable read only memories (PROMs) are used as the program store. Programming is also dealt with in some detail.

2943. SATICON: a new photoconductive camera tube with se as to target - Goto N., Isozaki Y., Shidara K. et al. - NHK Techn. Res. Lab., Setagaya, Tokyo - IEEE TRANS.ELECTRON DEVICES 1974 ED 21/11 (662-666)

In order to decrease lag and after images in blocking contact photoconductive camera tubes, sufficient electron mobility is required as well as hole mobility, even if a p type photoconductor is used. In this connection, a new photoconductive target of selenium doped with arsenic and tellurium has been developed. Arsenic doping is used to prevent selenium crystallization. Tellurium doping is used near the signal electrode to increase red sensitivity. Along with the hole blocking contact at the signal electrode, a blocking structure is formed on the beam scanned surface of the target to prevent injection of the beam electrons. The SATICON tube, employing this target, demonstrates the following characteristics: the sensitivity is 300 to 450 μ A/lm, the gamma is nearly unity, and the spectral response covers the entire visible region. A 2/3 in tube shows a modulation transfer curve as high as 30% at 400 TV lines. Its lag is 3% at a signal current of 200 nA. Applications to TV broadcasting are expected.

2944. Fracture mechanics of dental poly(methyl methacrylate) - Causton B.E. - Dent. Sch. London Hosp. Med. Coll., Univ. London - J.DENT.RES. 1975 54/2 (339-343)

Strength characteristics of dental poly(methyl methacrylate) were studied in terms of the fracture surface energy and inherent flaw size, using the methods of Berry. Dental poly(methyl methacrylate) is weaker than the corresponding bulk polymer because the former has a lower energy and higher inherent flaw size.

2945. Reinforced polycarboxylate cements - Barton J.A. Jr., Brauer G.M., Antonucci J.M. and

Raney M.J. - Dent. Res. Sect., Nat. Bur. Standards, Washington, D.C. 20234 - J.DENT.RES. 1975 54/2 (310-323)

Mechanical properties of polycarboxylate cements are greatly improved by incorporation of high modulus fibers such as potassium titanate into acrylic itaconic acid and acrylic itaconic aconitic acid copolymers. Other desirable properties of the cements are not changed by the addition of fibers.

2946. Generation recombination noise of junction gate field effect transistors - Boctor W.J. and Prasad S. - California Inst. Technol., Pasadena, Calif. - PROCIEE 1974 121/12 (1457-1459)

The generation recombination noise of junction gate field effect transistors is calculated taking into account the variable mobility. The field dependence of mobility, suggested by Trofimenkoff, is used, and the resultant spectral intensity of the drain noise fluctuations shows no signs of a logarithmic singularity at saturation. The need for any cutoff procedure to remove the logarithmic singularity at saturation is therefore removed, and it is thus an improvement over earlier methods.

2947. Thermodynamic consideration of the setting reaction in Ag_3Sn amalgams - Reynolds C.L. Jr. and Barker R.E. Jr. - Dept. Mat. Sci., Univ. Virginia, Charlottesville, Va. - J.BIOMED.MATRES. 1975 9/2 (213-219)

The setting reaction of Ag_3Sn amalgams may be thought of as a liquid phase sintering problem in which the reactants seek to form products with the lowest thermodynamic potential. The thermodynamic and kinetic considerations of this reaction are discussed. The lowering of free energy was given as the reason for the formation of the γ_1 , γ_2 , and β_1 phases and a qualitative reaction coordinate diagram was hypothesized. The barrier height for the formation of the β_1 phase is 137 kJ/mol.

1.3. Standards

2948. Diffraction losses associated with tungsten lamps in absolute radiometry - Boivin L.P. - Phys. Div., NRC Canada, Ottawa - APPL.OPT. 1975 14/1 (197-200)

The diffraction losses associated with absolute radiometers were calculated for the case where the source is a tungsten lamp used with a long wavelength suppressing filter. The calculations were done using Blevin's treatment, which assumes a point source and a single diffracting aperture. It was shown that this treatment is sufficiently accurate for a typical absolute radiometer configuration. The calculations were done for color temperatures in the 1600 to 3200 K range for 3 typical glass filters.

2. BIOPHYSICS AND BIOENGINEERING

2949. Estimating experimenter induced bias in field studies: a cautionary tale - Falk J.H. - Chesapeake Bay Cent. Environm. Studies, Smithsonian Inst., Edgewater, Md. 21037 - OIKOS (Kh.) 1974 25/3 (374-378)

Biological sampling procedures that remove organisms or litter from the system being studied potentially bias the results. Bias can be estimated by considering the experimenter as a consumer in the system, and comparing experimenter consumption to other organisms feeding at the same trophic level. H.T. Odum's classic work is examined in light of this theory, and it is shown how important it is for workers to consider experimenter impact when evaluating the results of their studies.

2950. A note on the mathematics of 'catch up' growth - Forbes G.B. - Dept. Ped., Univ. Rochester Med. Cent., Rochester, N.Y. 14642 - PEDIAT.RES. (Baltimore) 1974 8/12 (929-931)

The concept of 'catch up' growth is presented in terms of growth velocity. Mathematically speaking, size function is the integral of velocity function, regardless of the form of the function. The process of 'catch up' growth is complete only when the integrated velocity excess during recovery matches the previous velocity deficit.

2951. Observations on some commonly used methods for identification of parameters in linear systems - Bekey G.A., Ung M.T. and Karuza S. - Dept. Electr. Engin., Univ. South. California, Los Angeles, Calif. 90007 - SIMULATION 1974 23/3 (69-75)

This paper describes and compares the application of two alternative approaches to the identification of linear systems from input output data. The first approach is based on fitting input and output data by sums of exponentials and deriving the system structure and the parameter values from the resulting functions. The approach is based on assuming a differential equation structure and finding only the parameter values from the given data. The relative advantages, disadvantages and computational aspects of both approaches are discussed with reference to a specific biological problem. The results are applicable to a variety of engineering and scientific problems described by systems of first order linear differential equations.

2952. First Brazilian congress on simulation - Colso De Lima W. - SIMULATION 1974 23/3 (76)

The First Brazilian Congress on Simulation, organized by the Brazilian Simulation Society (Sociedade Brasileira Simulacao), was held in Recife, Brazil, at Escola de Engenharia da Universidade Federal de Pernambuco, July 10 to 17, 1974, in conjunction with the Twenty Sixth Annual Meeting of the Brazilian Association for the Advancement of Science. The work of the Congress included 41 papers, from which the Publishing Committee of the Proceedings selected 14 papers, abstracts of which appear in this article.

2953. Hybrid simulation of a computer controlled

evaporator - Oliver W.K., Seborg D.E. and Fisher D.G. - Dept. Chem. Engin., Univ. Alberta, Edmonton - SIMULATION 1974 23/3 (77-84)

A hybrid simulation was used to evaluate 2 multivariable computer control systems for a pilot scale double effect evaporator. The analog computer was used to simulate a linear 5 state variable dynamic model of the evaporator; the digital computer performed the control calculations for the 2 multivariable control systems: optimal feedback control and model reference adaptive control.

2954. The estimation of the gradient of a density function, with application in pattern recognition - Fukunaga K. and Hostetler L.D. - Sch. Electr. Engin, Purdue Univ., Lafayette, Ind. 47907 - IEEE TRANS.INFORM.THEORY 1975 IT-21/1 (32-40)

Nonparametric density gradient estimation using a generalized kernel approach is investigated. Conditions on the kernel functions are derived to guarantee asymptotic unbiasedness, consistency, and uniform consistency of the estimates. The results are generalized to obtain a simple mean shift estimate that can be extended in a k nearest neighbor approach. Applications of gradient estimation to pattern recognition are presented using clustering and intrinsic dimensionality problems, with the ultimate goal of providing further understanding of these problems in terms of density gradients.

2955. ^{45}Ca and ^{14}C EDTA efflux from dialyzed barnacle muscle fibers - Brinley F.J. Jr. and Spangler S.G. - Dept. Physiol., Johns Hopkins Univ. Sch. Med., Baltimore, Md. 21205 - BIOPHYS. 1975 15/3 (281-286)

^{45}Ca and ^{14}C labeled ethylenediamine N, N' tetraacetic acid (EDTA) effluxes were measured in internally dialyzed barnacle muscle fibers. In ^{45}Ca experiments the internal ionized ^{45}Ca was fixed at 0.2 μM with ethyleneglycol bis (beta aminooxyethylether) N, N' tetraacetic acid (EGTA). The ^{45}Ca efflux was found to increase with internal CaEGTA from 0.05 pmol/cm²/sec (CaEGTA = 0.02 mM) to 5.0 pmol/cm²/sec (CaEGTA = 9.6 mM). To determine whether or not most of this increase in efflux was due to the exit of undissociated CaEGTA, comparable experiments were performed with Ca^{14}C EDTA. Over the same range of internal calcium as studied in the ^{45}Ca experiments, the Ca^{14}C EDTA efflux was more no more 12% of the ^{45}Ca efflux. The exit of undissociated ^{45}Ca cannot account for most of the ^{45}Ca efflux nor can it account for the dependence of ^{45}Ca efflux on internal CaEGTA. The experiments also demonstrated the existence of an endogenous pool of calcium, of 0.43 nmol/kg (about half the total calcium), which remained unexchanged during dialysis.

2956. Final size distributions for epidemics - Ludwig D. - Courant Inst. Mathemat. Sci., New York Univ., New York, N.Y. 10012 - MATH.BIOSCI. 1975 23/1-2 (33-46)

For many diseases, the infectiousness of an individual depends upon the time elapsed since his own infection. This feature greatly complicated the analysis of the spread of infection within a population. Here it is shown

that this dependence upon elapsed time can be ignored, if attention is restricted to the distribution of the final sizes of epidemics. For every epidemic, there is a corresponding Markov chain which has the same final size distribution. Such Markov chains are constructed for models where there are several types of infectives, but only one type of susceptible individual, and if there are several types of susceptibles, but only one infective type. Some qualitative differences between these models are illustrated.

2957. Qualitative behavior of stochastic epidemics

- Ludwig D. - Dept. Mathemat., Univ. British Columbia, Vancouver - MATH.BIOSCI. 1975 23/1-2 (47-73)

The qualitative behavior of the distribution of final sizes of an epidemic is considered. The main features of this distribution depend upon 2 parameters. The first parameter is the extinction probability for a branching process, which approximates the early stages of the epidemic. The second parameter is the expected final size of a 'quasi deterministic' approximation, which describes the later stages of the epidemic. By combining the branching process and quasi deterministic approximation, an approximation to the final size distribution of the epidemic is obtained.

2958. Optimal control of a birth and death process population model

- Getz W.M. - Dept. Appl. Mathemat., Univ. Witwatersrand, Johannesburg - MATH.BIOSCI. 1975 23/1-2 (87-111)

A birth and death process population model is formulated to include positive and negative control parameters. The general solution for the distribution of the size of the population at any instant in time is obtained in the form of a probability generating function. The forms of the mean and variance are derived for constant birth and death parameters, and the values of the control parameters which steer the mean towards a target value are obtained. Optimal control to reach the target value is discussed with respect to minimizing a cost performance index. The cost of variance and the cost of determining the initial distribution of the population are taken into account. The analysis is extended to include piecewise constant parameters.

2959. On the existence of oscillatory solutions in negative feedback cellular control processes

- Tyson J.J. - Dept. Mathemat., State Univ. New York, Buffalo, Amherst, N.Y. 14226 - J.MATH.BIOL. 1975 1/4 (311-315)

It is shown that the differential equation $\frac{d^3Z}{dt^3} t(a + \beta + \gamma) \frac{d^2Z}{dt^2} + (a\beta + \beta\gamma + \gamma a) \frac{dZ}{dt} + a\beta\gamma Z = (1 + Z(m))^{-1}$ has at least one periodic solution past the instability of the solution, $Z = Z_0$, the unique real positive root of $a\beta\gamma Z = (1 + Z(m))^{-1}$.

2960. Sterility control: basic mathematical considerations

- MATHEMATISCHE GRUNDLAGEN DER STERILITÄTSPRÜFUNG - Spicher G. and Peters J. - Robert Koch Inst., Bundesgesundh. Amt, Berlin - ZBL.BAKT.REIHE A 1975 230/1 (112-138)

The subject of control of sterility in homogenous lots by means of random sampling

is discussed. The probability that nonsterile lots may be declared as accepted, was calculated by means of hypergeometric, binomial, and Poisson distribution. The following factors were considered: size of samples, size of lots, and degree of contamination of lots. The values obtained were reproduced in graphs. Reference is made to the conditions that have to be met in each case to enable a use of the various distribution functions for a calculation of the acceptance probability of nonsterile lots. Furthermore, the necessary size of samples to contain at least one contaminated unit was calculated by means of binomial distribution for probabilities of 90, 95 and 99%. For example, from a lot having a degree of contamination of 10%, 30 units would have to be assayed for sterility to recognize nonsterility of such a lot in 95% of cases. A degree of 10% contamination of 1% would require already 300 units to be examined. Thus, sterility control of a regularly sterilized lot performed in the common way would supply information on the aseptic technique of sterility control rather than on the degree of sterility of the lot examined. Furthermore, binomial distribution was used to calculate the dependency of acceptance probability of nonsterile charges upon the procedure of control. The following procedures were considered: A. a lot is accepted if the sample examined proved to be sterile; B. a lot is accepted if the sample is found to contain no more than a single nonsterile unit. C-F. Assay may be repeated if the sample examined contained one (C, E, F) or more (D) nonsterile units. Under procedures C and D, examination has to be repeated in a sample of identical size; under E, the second sample has to be of double, under F of 4 times the size of the first one. The curves calculated have shown that the probability of acceptance of nonsterile lots having a descending degree of contamination will increase faster under procedures B-F than under procedure A. Under procedures B-F and for samples of identical size, the probability of acceptance of nonsterile lots will always be higher than under A; this effect may be compensated, however, to the extent desired, by a corresponding choice of the sample size. The extent of rejections of sterile charges as nonsterile on account of external contamination during the sterility assay was determined by calculation. As long as the frequency of cases of external contamination is exceeding 1%, rejections for nonsterility will always exceed 10% of all sterile lots, provided procedure A is closely adhered to and the sample comprises at least 10 units. Under procedures B and C, the percentage of sterile rejected as nonsterile on account of external contamination was found to be considerably smaller than if applying procedure A. Provided a corresponding frequency of rejection of sterile lots on account of external contamination, there is a greater probability of recognizing lots having a comparatively high degree of contamination as being nonsterile than under procedure A. Since random sampling does not serve as a proof of the concept of 'sterile' in its absolute meaning to be met by a particular lot, the manufacturer of sterilised material has to use additional controls such as surveillance of

number and composition of bacterial flora of material prior to sterilisation and of the process of sterilisation.

2961. The effect of feedback on linear

multivariable systems - Mayne D.Q. - Dept.

Comput. Contr., Imp. Coll. Sci. Technol., London - AUTOMATICA 1974 10/4 (405-412)

Effective algebraic procedures for performing certain operations on matrix transfer functions are described, the most important being the calculation of the effect of feedback. Such operations are required, for example, in designing sequentially, controllers for linear multivariable systems. Previous papers have described algorithms for performing these operations numerically at special frequencies to obtain, for example, the closed loop matrix frequency response, in numerical form. However, if algebraic solutions, which are matrix transfer functions whose elements are rational functions, are required, naive use of standard formulae must be avoided, since they result in rational functions of needlessly high degree. This paper shows how this needless increase in the degree of the rational functions may be avoided, thus yielding effective algebraic procedures for the operations considered. Although the results are of interest in their own right, a brief resume of a specific procedure, the sequential return difference method, for designing linear multivariable control systems which utilizes these results, is given.

2962. A Monte Carlo simulation of chemical

reactions - Moehs W.D.C. - Dept. Phys., Purdue Fort Wayne, Fort Wayne, Ind. 46805 - MATH.BIOSCI. 1974 22 (113-120)

A computer based algorithm to solve complex chemical rate equations is introduced. A simple Monte Carlo sampling method is used to generate chemical reactions in numbers proportional to reaction probabilities, and a second order Runge Kutta method is used to calculate time. The method is compared with a closed form mathematical solution for a simple chemical system, and it is compared with a numerical integration of the rate equations for a more complicated system.

2963. Estimation of the parameters of a type I geometric distribution from truncated

observations on conception delays - Das Gupta P. and Hickman L. - Internat. Populat. Urban Res., Univ. California, Berkeley, Calif. 94720 - MATH.BIOSCI. 1974 22 (75-94)

In connection with the estimation of the average fecundability of a group of women, it has been assumed in the past that the waiting time for a conception follows a type I geometric distribution, and its 2 parameters have been estimated by the method of moments and the method of maximum likelihood. In a followup study there is always the possibility that some women will remain nonpregnant in the limited period of time they are observed, and the problem arises as to how to estimate the same parameters if the followup experiment is terminated after a fixed period of time. This paper deals with this truncation problem, and provides 3 different methods for estimating the

parameters, which are applied to data from the Menstrual and Reproductive History Study at the University of Minnesota. An extended model is presented which incorporates the possibility of dropout cases.

2964. Construction of an analog model to

estimate internal contamination by labeled thymidine. Pig experimentation and human implications - MISE AU POINT DUN MODELE DE

COMPARTIMENTS RELATIF A LA CONTAMINATION INTERNE PAR LA THYMIDINE MARQUEE. ETUDE EXPERIMENTALE CHEZ LE PORC. APPLICATION AUX SITUATIONS HUMAINES - Jockey P., Geronimi C. and Tellier N. - Commissariat Energie Atom., Fontenay aux Roses - THERAPIE 1975 30/1 (41-54)

Selecting established information from literature to estimate internal contamination in building an analog model is different from using analog methods to obtain new metabolic data in research work. In the first case experimentation is only necessary to check the validity of the model and to adjust coefficients, having in mind the dosimetric interpretation. Model adaptation to other situations and particularly to man is obtained by personalization of its coefficients from the subjects own excretion curve. The main limitation is in sensitivity: Is influence of an organ noticeable on the excretion curve? In some instances the shape of this curve gives an easy interpretation. It is the case of labeled thymidine internal contamination analysed by β (amino) isobutyric acid (BAIBA) excretion. BAIBA is the specific thymidine catabolite. Its excretion shows a peak 5 to 6 days after initial contamination. Existence of this peak is directly correlated to the initial fixation of thymidine on DNA synthesizing cells and its secondary release at cell death time. Possibilities of the method are analyzed and a chart showing the structure of the analog model is given.

2965. A new mathematical model to describe the physics of propagation

- Johns P.B. - Dept. Electr. Electron. Engin., Univ. Nottingham - RADIO ELECTRON. ENGINEER 1974 44/12 (657-666)

While Green's functions provide a powerful analytical means of solving the wave equation, they do not give a very realistic description of the mechanism of propagation. Also, the adaptation of Green's function techniques to numerical methods of solution is not easy. This paper introduces the assumption that propagation takes place in discrete steps, and it is shown that Huygen's principle then becomes physically much more realistic. The basis for a very simple numerical procedure for the solution of the wave equation is also provided.

2966. Optimizing non recursive digital filters to

non linear phase characteristics - Cuthbert L.G. - Dept. Electr. Electron. Engin., Queen Mary Coll., Univ. London - RADIO ELECTRON. ENGINEER 1974 44/12 (645-651)

Various methods based on optimization are used to design linear phase filters. One such method is to use a general purpose optimization program to minimize some error criterion, a function of the filter coefficients and of the error between the specified and achieved gain

responses. However, if this were to be used with arbitrary phase designs, the error criterion would have to be formulated as a function that combines the gain and phase errors in a meaningful way. It is shown here that this particular difficulty can be avoided by regarding the phase specification as a deviation from the linear phase, and splitting the characteristic into real and imaginary components, rather than gain and phase, and optimizing these separately.

2967. Non linear effects of high power ultrasonics in crystalline solids - Green R.E. Jr. - Dept. Mech. Materials Sci., Johns Hopkins Univ., Baltimore, Md. 21218 - *ULTRASONICS* 1975 13/3 (117-127)

The aspects of non linear elastic wave propagation in real crystalline solids pertinent to the field of high power ultrasonics are presented. Particular emphasis is placed on the role non linear elastic wave propagation may play in the ultrasonic softening process called the Blaha effect.

2968. A note on growth processes in random environment - Capocelli R.M. and Ricciardi L.M. - Lab. Cibernet. CNR, Arco Felice - *BIOLCYBERN* 1975 18/2 (105-109)

Certain features of population growth models proposed earlier are discussed and an alternative diffusion model is constructed for regulated growth in random environment. This model is shown to be the analogue of the Malthusian one, although it is a generalization of the latter due to the presence of regulation.

2969. Migratory effects in predator prey models - Chewning W.C. - Dept. Mathemat. Computer Sci., Univ. South Carolina, Columbia, S.C. 29208 - *MATH.BIOSCI.* 1975 23/3-4 (253-262)

The location of a predator and a prey species in each of N habitats, with migration between habitats allowed is considered as a vector problem in 2 N variables. The general conditions under which limited migration can have a stabilizing influence on locally unstable predator prey dynamics are identified. In the case of identical habitats with migration, the stability question is reduced to an eigenvalue problem for a pair of 2x2 matrices, and the reduction is interpreted biologically.

2970. An idealized concept of the true cladistic character - Estabrook G.F., Johnson C.S. Jr. and McMorris F.R. - Dept. Bot., Univ. Michigan, Ann Arbor, Mich. - *MATH.BIOSCI.* 1975 23/3-4 (263-272)

Estimating evolutionary relationships is basic to the objectives of systematics. Comparative data, structured as taxonomic characters, are usually the essential considerations on which such estimates are founded. Some taxonomic characters are more useful than others for structuring plausible estimates of evolutionary relationship. One of the primary challenges to the systematist is the construction of taxonomic characters most useful for this purpose. Since taxonomic characters are the result of action on the part of the systematist, they should be defined operationally. It is hoped, that these operationally defined characters will conform to

an ideal that, itself cannot be operationally defined in so far as the concept depends on history that is, usually, inherently unknowable. It is nonetheless, essential to conceptual methods that this ideal concept be well defined. The authors present a series of definitions leading to a clear concept of true cladistic character. This series includes definitions of the concepts: evolutionary unit, qualitative taxonomic character, monophyletic group, divergent character, true cladistic character, operational cladistic character, and the post factum ideal relation between an operational cladistic character and an estimate of cladistic history. A concise characterization of true cladistic character is presented.

2971. Solvable limit cycle in a Volterra type model of interacting populations - Strickfaden W.B. and Lawrence B.A. - Dept. Biol., Coll. Scis, California State Univ., San Diego, Calif. 92115 - *MATH.BIOSCI.* 1975 23/3-4 (273-279)

A simple, biologically more realistic, Volterra type model with a limit cycle for two interacting populations is presented. The limit cycle behavior is investigated analytically by the introduction of a solvable metamodel. For some values of the constants, the metamodel is equivalent to a van der Pol equation.

2972. Computer simulation in the training of ancillary medical interviewers - Smith C.P. - Dept. Electr. Engin. Med., Univ. South. California, Los Angeles, Calif. 90007 - *MATH.BIOSCI.* 1975 23/3-4 (281-288)

Computer simulations may be particularly useful in training ancillary medical interviewers for decision making. Role playing in anticipation of difficult situations is an accepted training technique. The computer program permits role playing under conditions of uncertainty by storing a 'difficult' patient, and presenting him to the novice along with options for interviewer responses. The interview model is on line, branching, stochastic and adaptive. It is a further example of the dynamic, multistage decision process described in earlier papers by Bellman, Kell and Hopgood.

2973. Biochemical oscillators. A search procedure - Rapp P.E. - Dept. Appl. Mathemat. Theoret. Phys., Univ. Cambridge - *MATH.BIOSCI.* 1975 23/3-4 (289-303)

The describing function technique can be employed in a search for periodic solutions to large systems of nonlinear differential equations that describe chemical reaction networks of a type encountered in biological contexts. The equations studied describe a reaction scheme in which the first reaction is inhibited by the product of the last reaction. The transfer function block diagram is established, and is seen to have closed feedback loop form, and to contain a linear block and a nonlinear block. The nonlinear block is replaced by the describing function which is related to the Fourier series of the nonlinear block's output.

2974. Fuzzy aspects of the parsimony problem in evolution - Marchi E. and Hansell R.I.C. - Dept. Mathemat., Univ. San Luis - *MATH.BIOSCI.* 1975

The parsimony or minimal evolution problem is generalized to incorporate the taxonomists evaluation of the relatedness of organisms. The theory of fuzzy sets is applied to the character space, the partitions of the set of organisms and as a consequence to the evolutionary trees. Continuity in the decision scheme leads to the definition of the Zadeh Box. A metric between trees is considered.

2975. On a population model - Stirzaker D. - Merton Coll., Oxford - MATH.BIOSCI. 1975 23/3-4 (329-336)

In simple habitats the population of field voles (*microtus agrestis*) exhibits cyclical behaviour, the population size oscillating with a period of 4 yr approximately. A simple model is suggested to describe these variations. A formal perturbation analysis of the resulting nonlinear delay differential equation yields results in agreement with the observations.

2976. Power laws in compartmental analysis. Part I. A unified stochastic model - Marcus A.H. - Univ. Maryland, Baltimore, Md. 21228 - MATH.BIOSCI. 1975 23/3-4 (337-350)

The transport of radioactive tracers and trace pollutants through the body is usually modeled as a multicompartment linear differential system, with constant exchange rates. The specific activity curves must then necessarily be mixtures of exponentials and non negative integer powers of the time since injection. This is inconsistent with observations on many systems, which exhibit specific activity curves with either negative powers of time, or arbitrary non integer positive powers of time with an exponential modification (gamma densities). A physiologically plausible random walk model is proposed, by which a single 4 parameter compound Poisson process for the residence time of a molecule of tracer in a compartment can fit all of the observed types of specific activity curves. The parameters have direct interpretations in terms of an age dependent molecular exchange rate between compartments. Multicompartment systems can be similarly modeled as a Markov renewal process.

2977. A model of inexact reasoning in medicine - Shortliffe E.H. and Buchanan B.G. - Div. Clin. Pharmacol, Stanford Univ. Sch. Med., Stanford, Calif. 94305 - MATH.BIOSCI. 1975 23/3-4 (351-379)

Medical science often suffers from having so few data and so much imperfect knowledge that a rigorous probabilistic analysis, the ideal standard by which to judge the rationality of a physician's decision, is seldom possible. Physicians nevertheless seem to have developed an ill defined mechanism for reaching decisions, despite a lack of formal knowledge regarding the interrelationships of all the variables that they are considering. This report proposes a quantification scheme, which attempts to model the inexact reasoning processes of medical experts. The numerical conventions provide what is essentially an approximation to conditional probability, but offer advantages over Bayesian analysis, when they are utilized in a rule based

computer diagnostic system. One such system, a clinical consultation program named 'Mycin', is described in the context of the proposed model of inexact reasoning.

2978. Life games and statistical models - Dresden M. and Wong D. - Inst. Theoret. Phys., State Univ. New York, Stony Brook, N.Y. 11794 - PROC.NATACAD.SCIUSA 1975 72/3 (956-960)

A set of equations was obtained, which described the rules of a class of games (life games). These games simulated the process of growth, death, survival and competition. The equations were nonlinear difference equations, where the degree of nonlinearity was directly related to the number of interacting neighbors. The time evolution and the development of geometric patterns could be studied using the equations as a basis. Extensions and generalizations, such as the introduction of stochastic elements, could easily be accommodated in the formalism. Some significant unsolved problems are noted.

2979. C systems - Engel A.B. - Cent. Theoret. Biol., State Univ. New York Buffalo, Amherst, N.Y. 14226 - MATH.BIOSCI. 1974 22 (33-43)

A class of dynamical systems that can be expressed by differential equations, is considered. This class of dynamical systems (C systems), belongs to the class of plane autonomous classifiers. The phase space of C systems is thoroughly characterized in the context of qualitative differential equations.

2980. Plane autonomous state classifiers - Engel A.B. - Cent. Theoret. Biol., State Univ. New York Buffalo, Amherst, N.Y. 14226 - MATH.BIOSCI. 1974 22 (19-31)

The theory of autonomous state classifiers is framed in the context of dynamical systems. Plane autonomous state classifiers are studied in depth within this context. A comprehensive theory of autonomous state classifiers is obtained. The relation of this theory to the problem of generalizing a saddle point is considered.

2981. Plane autonomous state classifiers as measuring devices - Engel A.B. - Cent. Theoret. Biol., State Univ. New York Buffalo, Amherst, N.Y. 14226 - MATH.BIOSCI. 1974 22 (45-56)

Object systems are studied on which plane autonomous state classifiers act as measuring devices. Several conclusions are drawn regarding the structure of the object system. The problem of coupling a plane autonomous state classifier with an object system is considered in detail.

2982. The supercritical p dimensional Galton Watson process with immigration - Kaplan N. - Dept. Statist., Univ. California, Berkeley, Calif. - MATH.BIOSCI. 1974 22 (1-18)

A supercritical multidimensional Galton Watson process with immigration is investigated. A simpler and more natural proof is given for the standard limit theorem for such processes. The limit random variable is also shown to be absolutely continuous. The assumptions on the immigration distribution are also investigated.

2.2. Mechanical systems

2983. Kinematics of normal locomotion. A statistical study based on T.V. data - Winter D.A., Quanbury A.O., Hobson D.A. et al. - Shriners Hosp. Crip. Child., Winnipeg - J.BIOMECH. 1974 7/6 (479-486)

A television computer system for the measurement and analysis of the kinematics of normal and abnormal locomotion was developed, and has the following characteristics: minimum encumbrance to the subject or patient, determination of absolute coordinates of anatomical landmarks, analysis of 3 or 4 strides, and automation of data conversion and analysis. Analysis techniques were developed which take advantage of the accuracy of the marker coordinates, and with suitable application of noise reduction filtering, permit direct calculation of velocities and accelerations (both linear and angular). Examples of some of these derived parameters vs. time are presented. The results of a statistical study on a group of normal subjects walking at slow, comfortable and fast cadences yield the ranges of many velocities and accelerations not previously available.

2984. A model for studies of mechanical interactions between the human spine and rib cage - Andriacci T., Schultz A., Belytschko T. and Galante J. - Dept. Materials Engin., Univ. Illinois, Chicago, Ill. 60680 - J.BIOMECH. 1974 7/6 (497-507)

A three dimensional mathematical model useful for studies of the mechanics of the human skeletal thorax is described. To construct this model, rib cage elements are incorporated into a previously reported model of the thoracolumbar spine. The vertebrae and bony portions of the ribs and sternum are idealized as rigid bodies. The behavior of the discs, ligaments and costal cartilages are modelled by deformable elements. Appropriate geometric and stiffness property data are assigned to the elements of the model. In constructing the model, it was found that the mechanical response of the costo vertebral joint is strongly influenced by articulation geometry. Although rigid bodies were used to model calcified portions of the ribs, the model predicted rib cage deformations in close agreement with those measured experimentally. These studies indicate that the rigid body motion of calcified portions of the rib makes a major contribution to the deformation of the rib cage in response to certain types of loadings. Quantitative results are also reported on the roles the rib cage plays in bending responses of the spine, the lateral stability of the spine, and the production and correction of several scoliotic deformities.

2985. A hydraulic pouch method for assessing muscle dynamics - Kunov H., Vachon B.R. and Zingg W. - Inst. Biomed. Electron. Engin., Univ. Toronto - MED.BIOENGINEERING 1975 13/1 (65-70)

A simple method is described for measuring some mechanical parameters of flat muscle tissue in vivo. The method can be implemented with equipment normally found in a physiological

laboratory with the addition of a few extra components. A small pouch is formed from the muscle, and into this is inserted a fluid filled balloon which can be connected to a variety of hydraulic measurement circuits. The technical and physiological limitations of the system are discussed, and some representative measurements are given.

2986. Dynamics of human teeth in function by means of double pulsed holography; an experimental investigation - Wedendal P.R. and Bjelkhagen H.I. - Dept. Stomatognathic Physiol., Fac. Odontol., Roy. Caroline Inst., Stockholm - APPLOPT. 1974 13/11 (2481-2485)

Investigation in vivo of small deformation and mobility processes in the masticatory system of man has been until now a very intricate problem. Mechanical as well as noncontact methods have been utilized earlier in order to record the mobility pattern of teeth and prosthodontic appliances. In this paper holographic interferometry is presented as a solution of some odontological measurement problems. The method was first tested in a simulator arrangement and then used in a number of clinical experiments. A special, totally reflecting paint was used for surface preparation prior to holography. A Q switched double pulsed ruby laser was combined with an electronic subminiature force sensor for pulse triggering, which was actuated by the masticatory force of the patient. Force increases and pulse positions were registered synchronously on the screen of an oscilloscope. The applied force exerted by the patient's masticatory muscles could thus be defined according to its point of application, direction, amplitude, and duration. The corresponding surface deformation was evaluated by means of a synchronized, double exposed hologram. Conclusions are drawn regarding the relative and absolute mobility of the teeth and related structures of the photographed jaw section.

2987. The resistance of the lumbar spine to direct shear - King Liu Y., Ray G. and Hirsch C. - Biomechan. Lab., Tulane Univ. Sch. Med., New Orleans, La. - ORTHOP.CLIN.NAMER. 1975 6/1 (33-48)

This report described a method of estimating the forces and moments applied to the intervertebral discs at all lumbar spine levels by the musculature. It was assumed that all muscles exert the same level of effort. The angle of inclination of the muscles and their lines of action were accounted for. The forces and moments were calculated as a function of the angle of flexion or extension of the spine. The role of ligamentous structures provoked considerable discussion, because it was assumed that under resting conditions the ligaments take no tension. Whether prestress existed in the structures is discussed.

2988. Mechanical properties of bone - PROPRIETES MECANIQUES DE LOS - Sedel L. - Lab. Anat., UER Sts Peres, Paris - REV.CHIR.ORTHOP. 1974 60/8 (643-656)

The author reviews the literature concerning the main studies devoted to a better knowledge of mechanical properties of bone. The research works presently in progress are pointed out and

a synthesis of the obtained results is attempted. Some surgical consequences are described.

2989. Biomechanical and biomaterial considerations of natural teeth, tooth replacements, and skeletal fixation - Buch J.D., Crose J.G. and Bechtol C.O. - Aerospace Corp., El Segundo, Calif. - BIOMAT.MED.DEV.ARTIF.ORGANS. 1974 2/2 (171-186)

The biomechanics of natural teeth, ankylosed teeth, and various tooth substitute combinations were studied. It was found that the periodontal ligament totally dominates the biomechanics of normal teeth, acting as an effective shear transfer layer and minimizing stress concentrations in the socket wall. It was further found that most tooth replacement concepts severely disturb the biomechanics. One combination, acrylic plus steel, was found to reproduce quite accurately the natural biomechanics.

2990. A model of cochlear function - Barrett T.W. - Dept. Physiol. Biophys., Univ. Tennessee Cent. Hlth Sci., Memphis, Tenn. 38163 - BIOPHYSJ. 1975 15/II (271A)

Recent analyses in structural information theory (Barrett, 1973 and 1974) indicate that the cochlea analyzes concurrently an acoustical signal's center frequency ($f(o)$), midperiod ($t(o)$), bandwidth (Δf) and also its duration (Δt), so that for a minimum an elementary signal is obtained: $\Delta f \times \Delta t = f(o) \times t(o) = 1/2$. The analysis presented extends this investigation to cochlear models. Because the basilar membrane decreases in thickness from base to apex while increasing in width, by dimensional analysis the problem of cochlear sound reception is analogous to that of a wave breaking on a beach. Unfortunately the latter hydrodynamic problem has been solved only for a few instances and no generalized solution exists. Another dimensional analysis suggests that cochlea dynamics are analogous to those of a shock wave in a gas. In this situation the medium is considered isentropic and amenable to treatment by field equations. A model for the cochlea is thus obtained based on flow, the Hugoniot relations and impedance resonance. The model accounts for spatial or Fourier dispersion of frequencies and effects a distinct representation of elementary signals versus sinusoids, indicating a Laplace transformation of signals such that sinusoids and sinusoidal components of elementary signals are represented on a Fourier (imaginary) longitudinal axis, and 1/2 octave bandwidth components of elementary signals on a transverse (real) axis. The present model differs from others as follows: it is neither an electrical network nor a phenomenological model; it accounts for 2 dimensional cochlea forces rather than merely 1 dimensional; the forces acting on the basilar membrane are calculated analytically rather than by boundary condition methods.

2991. Possible contribution of basement membrane to the structural rigidity of blood capillaries - Murphy M.E. and Johnson P.C. - Dept. Physiol., Univ. Arizona Coll. Med., Tucson, Ariz. 85724 - MICROVASC.RES. 1975 9/2 (242-245)

It is well known that a continuous basement membrane is a component of most blood capillaries. It has also been demonstrated that capillaries behave as rigid tubes. Recent observations on basement membrane material isolated from renal tubules indicates that this specialized form of connective tissue has a Young's modulus comparable to that of tendon. This finding is consistent with biochemical analysis of basement membranes which show this material to be composed partially of collagen. Assuming Young's modulus for capillary basement membranes to be similar to that found in renal tubules, the authors' calculations indicate that this material may be largely responsible for capillary rigidity. This may be especially true in capillary networks such as the renal glomerulus where there is a paucity of other tissue elements to provide structural support of the capillary.

2992. Experiments in models and in vivo on the properties and the diagnostic value of the pulse pressure transformation - Kenner Th. - Physiol. Inst., Univ. Graz - PFLUG.ARCH.EUR.J.PHYSIOL. 1975 355/Sup. (No. 54)

The pulse pressure transformation (PPTF) is defined as the quotient of two complex pressure events in the arterial system. The spectral components of a central and a peripheral pulse are computed by Fourier analysis. The PPTF then is the quotient of central and peripheral pressure components, usually plotted as locus diagram in the complex plane. In a homogenous transmission line model a characteristic dependence of the PPTF on the properties of the elastic wall of the tube, on the outflow resistance and on the position of the pressure recording site can be demonstrated. In an inhomogenous transmission line model the basic properties of the PPTF are surprisingly similar as in the homogeneous tube. The model was simulated on a Hewlett Packard 2100 A digital computer. Testing of the PPTF in models is quite important for the interpretation of the PPTF measured in vivo. Measurements and analyses were made from aortic and femoral pulses in dogs, cats and rabbits. In humans the PPTF can be noninvasively measured from sphygmograms. The diagnostic value of the PPTF may be characterized by the fact, that it uniquely reflects the overall properties of the arterial system. However, due to the number of variables influencing the shape of the function the interpretation is sometimes quite difficult.

2993. Biomechanical findings in a random survey of fifth toe abnormalities - Haber L., Winthrop L. and Weiner S.S. - Oxford Hosp., Philadelphia, Pa. - J.AMER.PODIATASS. 1975 65/3 (206-211)

A random survey of biomechanical findings in 18 patients who had undergone surgery for fifth toe contractures was carried out. In the study, calcaneal inversion, eversion, tibial varum, forefoot varus, ankle dorsiflexion and calcaneal stance position were measured, and it was found that a biomechanical imbalance existed. The authors believe that many patients should be fitted with an orthotic device after surgical correction of a fifth toe deformity, in order to reduce the chance of recurrence by

accommodating any existing biochemical abnormalities.

2994. A model of brain shear under impulsive torsional loads - Firoozbakhsh K.K. and DeSilva C.N. - Dept. Mechan. Engin., Pahlavi Univ., Shiraz - J.BIOMECH. 1975 8/1 (65-73)

This investigation is concerned with the theoretical determination of the behavior of the brain when the human head is subjected to torsional loadings. The mathematical model consists of a linear viscoelastic sphere which is bounded by and bonded to a rigid spherical shell. Two problems of torsional wave propagation from the rigid shell into the viscoelastic medium are solved in closed form. The first problem deals with dynamic response of the viscoelastic sphere when the angle of twist of the outer rigid shell about a vertical axis is a given function of time. The second problem is to determine the motion of the shell and viscoelastic sphere when the former is acted upon by a time dependent torque.

2995. Model of an oculomotor subsystem - Kulkarni S.A. and Wadia N.H. - Visvesvaraya Reg. Coll. Engin., Nagpur - INT.J.BIOMED.COMPUT. 1975 6/1 (1-21)

One of the complex control systems present in the human body is the oculomotor control system. There are 2 major modes of ocular movements, viz. saccadic and smooth pursuit. More knowledge about the neuromuscular mechanisms controlling these eye movements is obtained if experiments are carried out on subjects whose 2 types of eye movements are differentially affected due to disorders at their higher centres of control. Eye movements of patients with a novel form of heredofamilial spinocerebellar degeneration have been measured and quantified. These have been compared with those of normal subjects. Subsequent analysis indicates a continuous fourth order transfer function for the smooth pursuit eye in skull movements in the horizontal plane with head stationary.

2996. A one dimensional viscoelastic model of cat heart muscle studied by small length perturbations during isometric contraction - Loeffler L. III and Sagawa K. - Dept. Biomed. Engin., Sch. Med., Johns Hopkins Univ., Baltimore, Md. 21205 - CIRCULAT.RES. 1975 36/4 (498-512)

To develop a model of heart muscle, the authors studied cat papillary muscle contracting in a quasi isometric condition under a fixed inotropic state. The properties of resting muscle were determined by using a step stretch of less than 1.2% of L_{max} for initial lengths from 85 to 100% of L_{max} . The passive force response suggested the model of the passive branch. All five parameters were small at muscle lengths below 95% of L_{max} but increased markedly at longer lengths. The properties of contracting muscle were studied with a sinusoidal length change (amplitude <0.15% of L_{max} frequency 0.1 to 35.0 Hz). The frequency response of active (total minus passive) stiffness suggested the model of the active branch. The dependency was determined of the elastic elements (K , K_s) and the viscous element (C) on length and time by

recording the frequency response at various combinations of length and time. K_s varied linearly with active force ($F(A)$) K and C exhibited time courses that paralleled $F(A)$ up to 0.6t(max), and they maintained their values until 1.4t(max). K then fell toward zero, whereas C exhibited a secondary rise before it fell toward zero. K was independent of length up to 95% of L_{max} and then began to decline, but C varied in proportion to muscle length.

2997. Normal modes in vocal cord tissues - Titze I.R. and Strong W.J. - Dept. Phys., Coll. Petroleum Minerals, Dhahran - J.ACOUST.SOCAMER. 1975 57/3 (736-744)

The human vocal cord is treated as an elastic material capable of propagating compressional, shear, and surface waves. A mathematical formulation for commonly observed vibrational modes is developed. This includes horizontal as well as vertical tissue displacements. Current vocal cord models are discussed and evaluated in terms of their ability to adequately describe the vibrational degrees of freedom of the cords.

2.3. Heat and thermodynamics

2998. Thermal responses to small length changes in active muscle - Gilbert S.H. and Matsumoto Y. - Emory Univ., Atlanta, Ga. 30322 - BIOPHYSJ. 1975 15/II (125A)

Earlier work has shown that small ($\Delta l \leq 0.5\%l_0$) quick releases in active muscle are accompanied by a production and absorption of extra heat that follows the time course of the tension change (Gilbert and Matsumoto, 1974). Larger releases ($1\% \leq \Delta l \leq 3\%l_0$) are accompanied by larger amounts of extra heat with a biphasic time course. The first phase accompanies and is directly proportional to the tension change associated with the release as would be expected of thermoelastic heat. The second phase is unreversed and accompanies tension redevelopment after the length change ends. It is roughly proportional to Δl , as would be expected of shortening heat ($h(s)$) produced by the shortening of a 'contractile component' as tension is redeveloped. However, further examination of the time course of the second phase of heat showed that some tension redevelopment (equivalent to a shortening of 0.5%l₀) occurs with no concomitant production of h(s) even following large releases. Thus tension recovery following a quick release occurs by 2 thermally distinguishable processes, only 1 of which produces extra heat. Small quick stretches were also found to be accompanied by a biphasic thermal response even for $\Delta l \leq 0.5\%l_0$. The first phase is an absorption of heat as tension rises and seems to be of thermoelastic origin. The second phase is an unreversed production of extra heat as tension falls. The extra heat remaining after stretch is approximately equal to the work applied during stretch but is not produced simultaneously with it. The time course of the second phase follows that predicted if a time course of 'lengthening heat' during tension

decay is calculated, assuming Hill's coefficient a to apply for $P > P_0$. Thus tension recovery following stretch seems to be accomplished by only 1 thermally characterizable process, which produces extra heat.

2.4. Bioacoustics

2999. Directional hearing of a harbor seal in air and water - Terhune J.M. - Zool. Inst., Aarhus Univ., Aarhus - JACOUST.SOCAMER. 1974 56/6 (1862-1865)

Minimum audible angles (MAA) of a harbor seal were determined using a click train stimulus (left right, forced choice) and found to be $9^\circ \pm 4^\circ$ underwater and $3^\circ \pm 4^\circ$ in air. After accounting for the sound speed differences, the MAAs and the similarities of the psychometric functions suggest that interaural time differences provide the most important clue. The findings indicate that the interaural distance is the same in both media. An implication of this is that nonbony tissues are not sound transparent in water. MAAs in air were determined using other signal types. Click trains and 1/3 octave noise sources above 3 kHz were localized with greater acuity than sinusoidal or low frequency noise stimuli. The findings indicate that signals containing well defined time clues are localized more readily than signals containing only intensity and/or phase information.

3000. Acoustical properties of blood: a look at the basic assumptions - Ahuja A.S. - Rust Coll., Holly Springs, Miss. 38635 - MED.PHYS. 1974 1/6 (311-316)

The results from the literature on acoustics in suspensions, excluding the phenomena of relaxation, were applied to study the effects of red cell and plasma densities, compressibilities, viscosities, thermal conductivities, and surface tension on the propagation of sound in blood. For the calculations of the viscous and the thermal absorptions and the velocity of sound in blood, the red cell may be treated as a rigid spherical particle containing the same volume. For the calculation of thermal absorption, the erythrocyte may be treated as a spherical particle of finite thermal conductivity at all frequencies; but for the calculation of the velocity of sound, the effect of heat conduction can be ignored above 1 MHz and Wood's sound velocity formula may be used. The calculated sound absorption due to shear viscosity and thermal conduction in whole blood constitutes a significant portion (about 60% or more) of the measured value of the total absorption toward the lower frequency range (1 MHz or less) and a negligible portion (about 15% or less) of the total absorption toward the higher frequency range (10 MHz or more).

3001. A prosodically guided speech understanding strategy - Lea W.A., Medress M.F. and Skinner T.E. - Def. Syst. Div., Sperry Univac, St. Paul, Minn. 55165 - IEEE TRANSACOUST.SPEECH SIGN.PROC. 1975 ASSP 23/1 (30-38)

This strategy for computer understanding of speech uses prosodic features to break up

continuous speech into sentences and phrases, and locate stressed syllables in those phrases. The most reliable phonetic data are obtained by performing a distinguishing features analysis within the stressed syllables, and by locating sibilants and other robust information in unstressed syllables. The numbers and locations of syntactic boundaries and stressed syllables are used to select likely syntactic and semantic structures, within which words are hypothesized to correspond to the partial distinguishing features matrices obtained from the segmental analyses. Portions of this strategy were implemented and tested with hundreds of seconds of speech, involving 15 talkers. A program for detecting syntactic boundaries from fall rise patterns in fundamental frequency contours correctly detected over 90% of all predicted boundaries. An algorithm for locating stressed syllables (from fundamental frequency contours and high energy syllabic nuclei) correctly located the nuclei of over 85% of all those syllables perceived as stressed by a panel of listeners. A study of segmental analysis results obtained by several other research groups showed that phonetic recognition clearly is most successful in the stressed syllables. Procedures for classification of stressed vowels, location and classification of sibilants, and location of stops, nasals, and (r) like sounds were implemented. Prosodic aids to parsing and semantic analysis are being investigated.

3002. An objective parallel evaluator of segmentation/classification performance for multiple systems - Silverman H.F. and Dixon N.R. - Speech Proc. Group, Dept. Computer Sci., IBM Thomas J. Watson Res. Cent., Yorktown Heights, N.Y. 10598 - IEEE TRANSACOUST.SPEECH SIGN.PROC. 1975 ASSP 23/1 (92-99)

A major difficulty in the development of methodologies for segmentation and classification in automatic recognition of continuous speech is the determination of objective, reliable performance statistics. Compounding the difficulty is the large amount of data necessary to make reasonably accurate performance estimates. The system described provides for concurrent objective evaluation of up to 5 independent segmentation/classification methods against a single, carefully transcribed referent. A basic assumption of the evaluator is that the systems to be compared, as well as the referent, can each use the same digital data as input. Violation of this assumption would lead to time shift errors, and objective comparison among systems would be exceedingly difficult. For segmentation, the evaluator provides first order statistics, at the phonetic, class and summary levels, in the form of highly concise tables for the following 4 types of errors: missed events; adventitious events; misplaced events; and adventitious and misplaced events. For classification, first order statistics are derived in the form of confusion matrices at the phonetic, class and summary levels. While the system is still in the developmental process, it is operational and currently used. Examples of output are presented.

3003. Computer exploration of fast speech rules -

Friedman J. - Dept. Computer Communicat. Sci., Univ. Michigan, Ann Arbor, Mich. - IEEE TRANSACOUST.SPEECH SIGN.PROC. 1975 ASSP 23/1 (100-103)

A set of fast speech rules was tested on the computer using the phonologic grammer tester (PGT) program of Friedman and Morin. The types of difficulties encountered in the rules are examined and ways in which the program can be made more useful for studying fast speech rules are discussed.

3004. Syllable as a unit of speech recognition - Fujimura O. - Bell Lab., Murray Hill, N.J. 07974 - IEEE TRANSACOUST.SPEECH SIGN.PROC. 1975 ASSP 23/1 (82-87)

Basic problems involved in automatic recognition of continuous speech are discussed with reference to the recently developed template matching technique using dynamic programming. Irregularities in phonetic manifestations of phonemes are discussed, and it is argued that the syllable, phonologically redefined, will serve as the effective minimal unit in the time domain. English syllable structures are discussed from this point of view using the notions of 'syllable features' and 'vowel affinity'.

3005. A phonetic context controlled strategy for segmentation and phonetic labeling of speech - Mermelstein P. - Haskins Lab., New Haven, Conn. - IEEE TRANSACOUST.SPEECH SIGN.PROC. 1975 ASSP 23/1 (79-82)

This paper considers a sequential strategy for acoustic phonetic speech analysis. Each analysis process is applied to an appropriately labeled speech segment and results in a possible subsegmentation of the original segment. The segments resulting from the analysis are labeled according to the analysis results. The advantages of the strategy are that no more segments are considered than those actually differentiated by the analysis steps. The extraction of acoustic cues pertinent to a phonetic feature can be tuned to classes of sounds separated on the basis of other cues, and this serves to increase the reliability of segment labeling. The analysis sequence yields a structure for the syllabic units of the speech signal that may be used to retrieve similar syllabic units for detailed comparison.

3006. Duration intensity reciprocity for equal loudness - McFadden D. - Dept. Psychol., Univ. Texas, Austin, Tex. 78712 - JACOUST.SOCAMER. 1975 57/3 (702-704)

Magnitude estimates were obtained for 100 Hz tone presented at all combinations of seven different intensities and seven different durations. Power functions were plotted for each duration separately. These functions were horizontally intersected at several different values of judged magnitude, and the intensities necessary for equal judgement were determined and then plotted as a function of duration. The latter functions, which are analogous to classical acoustic integration curves, indicate that for equal judged loudness, intensity must be decreased by between 3 and 15 dB for each doubling of duration, depending upon the subject. Thus, for some subjects, the acoustic integration curves for loudness are much steeper

than those typically obtained using more conventional techniques.

3007. Dichotic masking of consonants by vowels - Repp B.H. - Psycholinguistics Lab., Univ. Chicago, Ill. 60637 - JACOUST.SOCAMER. 1975 57/3 (724-735)

The dichotic masking effects of a vowel (/a/) on consonant (CV) syllables (stop + /a/) were investigated by comparing the effect of CV masks with the effect of CV masks in which the vowel was shortened and the effect of an isolated vowel mask. The vowel exerted a clear masking effect, both when isolated and when in CV context, but this effect was much less pronounced than the 'masking' produced by a competing consonant. It was hypothesized that consonants exert their 'masking' effect on consonant targets at a central (phonetic) level, while vowel masking is largely a peripheral (auditory) phenomenon. Detailed analysis of the vowel masking effect revealed several distinct components. The 2 most interesting effects were a relationship between stimulus onset asynchrony and the probability of voiced responses, which was interpreted as masking and substitution of the cue of voice onset time, and a relationship between the pitch contour of the vowel mask and the probability of a voiced response, which suggested that the pitch contour of an isolated vowel may act as a voicing cue when paired with a consonant in the other ear. While all these effects were interpreted as consequences of relatively peripheral binaural mixing, the possibility that part of the vowel masking effect occurred at a later, phonetic processing stage could not be excluded.

2.5. Biooptics

3008. A model for neural signal to noise ratio improvement in the insect visual system with implications for 'anomalous resolution' - Northrop R.B. - Dept. Electr. Engin. Computer Sci., Univ. Connecticut, Storrs, Conn. 06268 - BIOLCYBERN. 1975 17/4 (221-235)

The descending contralateral movement detector (DCMD) neurons in locusts have been used in studies of limiting spatial resolution of moving, striped objects. The results of such studies have been controversial; one group of workers claiming resolution to below a 0.3° stripe period, while another group not finding significant responses below a 1.5° period when an extremely precise pattern was used. The latter group has justified their experimental findings using classical optical theory which treats the receptor and its dioptric apparatus as a simple convex lens with a 33 μ m pupil. It is argued in this paper that this is an oversimplification of this system, and that the best model for the dioptrics of a retina cell is given by its directional sensitivity function (DSF) which is in effect the spatial impulse response of the in vivo system which relates effective absorbed light intensity to the angular position of a point source. A neural model is proposed in this paper which produces improved signal to noise ratio (SNR) at detector interneurons over the SNR in the photoreceptor. The model offers noise

reduction from averaging at multisynaptic signal transmission points and contrast improvement from multiplicative signal processing (MSP). A numerical example is given to illustrate the plausibility of the model, using reasonable values for known and assumed parameters. The model is compatible with known anatomy and physiology in the locust visual system. However, the existence of a presumed exponential synaptic transfer characteristic and operation of the MSP system *in vivo* remain to be verified experimentally.

3009. Calcium release from pigmented granules is essential for phototransduction in Aplysia giant neurons - Brown A.M., Baur P.S. and Tuley F.H. - Dept. Physiol. Biophys., Univ. Texas Med. Branch, Galveston, Tex. 77550 - BIOPHYSJ. 1975 15/2II (171A)

Illumination of Aplysia giant neurons increases K^+ conductance of the plasma membrane (Brown and Brown). The response is simulated by intracellular pressure injection of Ca^{2+} and is reversibly blocked by injection of EGTA (Brown and Hughes). Since cytoplasmic pigmented granules show marked ultrastructural changes following illumination (Henkart) their calcium content was examined using an electron microprobe (EDAX). A pair of giant cells was dissected under red light and one neuron was exposed to white light ($10^5 \text{ erg cm}^{-2} \text{ sec}^{-1}$) for 5 to 30 mins. The neurons were fixed in an osmotically buffered, 0.1M Hepes solution pH7.4 containing 5% glutaraldehyde, post fixed in 1% osmium tetroxide and dehydrated in ethanol. Granules from sections of 700 \AA thickness were examined at 20,000 magnification, 20 KeV on a Cambridge S4 10 scanning microscope and equivalent volumes from non illuminated 'dark' and illuminated 'light' neurons were counted for equal periods. Compared to the spectrum for 'dark' granules, the spectrum of light granules showed smaller peaks for Na and P and virtual absence of Ca and S peaks. These alterations in elemental composition preceded ultrastructural changes. Cooling to 9°C reversibly abolishes the light response and prevents the release of Ca^{2+} from the granules. Hence, illumination of the pigmented granules releases Ca^{2+} which diffuses to the surface membrane, increases gK and hyperpolarizes the neuron. Ca^{2+} release is the primary event in this particular phototransduction process. The mechanism in the vertebrate rod photoreceptor may be similar.

3010. Visual construction of color is digital - Kolers P.A. and Von Grunau M. - Dept. Psychol., Univ. Toronto - SCIENCE 1975 187/4178 (757-759)

When disparate shapes are flashed under the appropriate temporal and spatial conditions, the human visual system resolves their disparity smoothly and continuously. No equivalent supplementations are found for color, which the system resolves by abrupt transformation. Shape and color reveal themselves, contrary to some modern theorizing, as properties handled in different ways by the visual nervous system, continuous or analog for shape, abrupt or digital for color.

3011. Laser speckles and the depth of field of the human eye - Ronchi L. and Fontana A. - Ist. Naz. Ottica, Florence - OPTICA ACTA 1975 22/3 (243-246)

The literature is rich in reports concerning the depth of field of the human eye. Some authors have derived it by calculation, by assuming that the eye is an aberration free, perfect optical instrument, limited only by pupil diffraction. Others measured the depth of field using different psychophysical techniques, and different indices of visual responsiveness, such as the deterioration of visual acuity, the discrimination of the least perceptible blurring or the loss of visibility through the loss of contrast. The main conclusion is that no absolute value can be given for the depth of field of the human eye, since it depends upon several factors, and, amongst others, on the test conditions. The present paper aims at producing some estimates of the depth of field, based on the observation of laser speckles.

3012. Visual apparent motion and some preferred paths in the rotation group $SO(3)$ - Foster D.H. - Appl. Opt. Sect., Dept. Phys., Imp. Coll. Sci. Technol., London - BIOLCYBERN. 1975 18/2 (81-89)

The sequential presentation of 2 distinct stimulus objects to the visual system will, under certain conditions, induce an apparent motion effect, called beta motion, in which the first object appears to smoothly transform into the second. This study is concerned with the kinds of paths selected by the visual system in effecting beta motion in which the metric structure of the object is preserved throughout. Two schemes are advanced according to which the visual system might operate. The first concentrates upon the manifold M in which the object appears to transform and the second upon the group G of transformations of M onto itself in which the particular transformation describing this motion lie. Under the identification of M with the 2 sphere S^2 , each scheme specifies the action minimizing curves in the rotation group $SO(3)$ for a particular natural Riemannian metric. An experiment is described in which a determination is made of the actual paths taken by an object undergoing various rigid motion beta motions. The results obtained indicate that the visual system behaves more in accordance with the second scheme than with the first. A generalization of this result is briefly discussed.

3013. A model for the mechanism of light and dark adaptation of vertebrate cones - Hara K.I. and Kurose M. - Dept. Electron. Engin., Toyama Univ., Toyama - BIOLCYBERN. 1975 18/2 (119-122)

A model is proposed for the mechanism of light and dark adaptation of vertebrate cones, especially for the operating curves shifting during light and dark adaptation, on the basis of physiological results. The mechanism is modeled in terms of bleaching levels and background effects through horizontal cell feedback loops. Furthermore, the spectral sensitivity of vertebrate cones is examined with the model. Simulations of the model are made, and the results of the simulations coincide very well with experimental results.

2.6. Gas physics

2014. Oxygen tension in a capillary tissue system subject to periodic occlusion - Hyman W.A., Grounds D.J. and Newell P.H. Jr. - Bioengin. Program, Texas A & M Univ., College Station, Tex. 77843 - MICROVASC RES. 1975 9/1 (49-63)

A mathematical model and digital computer simulation of oxygen transport in skeletal muscle was developed to simulate conditions of periodic ischemia. The model used the Krogh cylinder as a geometric basis for transcapillary exchange. Equations were developed which model the physical processes of convection and oxyhemoglobin dissociation in a well stirred capillary, and the coupled tissue processes of axial and radial diffusion, metabolic consumption and lactic acid production. The effect of these processes on tissue oxygenation was demonstrated by solutions for steady state and transient conditions involving periodic occlusion of the capillaries. The significance of a local oxygen debt was demonstrated as a factor in recovery from ischemic conditions.

3015. On equation of gas transport in the lung - Yu C.P. - Dept. Engin. Sci., Aerospace Engin. Nucl. Engin., State Univ. New York, Buffalo, N.Y. 14214 - RESP. PHYSIOL. (Amst) 1975 23/2 (257-266)

Based upon Weibel's lung model, an equation which describes one dimensional gas transport in the lung is derived. It is shown in this equation that the gas transport in the airways is due simultaneously to bulk motion and longitudinal diffusion. The longitudinal diffusion consists of the usual molecular diffusion and an apparent diffusion which arises from nonuniform distribution of the gas to the airways and a profile interaction effect of the gas due to Taylor's mechanism in each individual airway. Expressions for the apparent diffusion coefficient are obtained. This apparent diffusion, which has been neglected in almost all previous studies of gas transport in the lung, is shown to be of dominant importance in the upper airways.

3016. Decompression and decompression sickness - DRUCKFALL UND DRUCKFALLKRANKHEITEN - Kirchhoff H.W. - Schubertstr. 60, Giessen - MED.TECHN. (Stuttg.) 1975 9/2 (29-33)

Decompression means a rapid, though not almost instantaneous lowering of barometric pressure. Decompression causes physiological disturbances and symptoms of diseases following exposure to hyperbaric conditions called caisson disease, or from hyperbaric pressure in aviation. Mild symptoms are called 'dysbarism'; more severe cases 'decompression sickness'. The etiology and symptomatology of disturbances resulting from hyperbaric or hypobaric pressure are nearly identical.

3017. Dynamic relationships between pressure and flow in the human aorta - DYNAMISCHE DRUCKSTROMUNGS VERHALTNISSE IN DER MENSCHLICHEN AORTA - Aaslid R. and Brubakk A.O. - Inst. Techn. Kybernet., Techn. Hochsch., Trondheim - VERH.DTSCH.GES.KREISLFORSCH. 1974 no.40 (154-158)

It was examined whether a simulated model of the human aorta could illustrate the pressure and flow relationships in individual people. The cardiac output was determined with sufficient accuracy with the aid of the aortic pressure curve and the pulse transmission time. An automatic servo system made it possible to follow rapid changes in the state of the circulation.

3018. Kinetics of water loss from cells at subzero centigrade temperatures - Mansoori G.A. - Dept. Energy Engin., Univ. Illinois, Chicago, Ill. 60680 - CRYOBIOLOGY 1975 12/1 (34-45)

A mathematical model is developed for the calculation of the kinetics of water loss from cells at subzero centigrade temperatures. In this model, it is assumed that the cell surface membrane is permeable to water only, the protoplasm is a non ideal solution, the cells are spherical and during the cooling process, the cell temperature is not uniform inside the cell. It is also assumed that because of water loss due to cooling process, the cell volume and the cell surface area reduce and the reductions in surface area and volume of the cell are functions of the amount of water loss from the cell. Based on this model, and for different conditions, the fractions of supercooled intracellular water remaining in the cells at various temperatures are calculated. It is shown that for cooling cells at subzero centigrade temperatures: the consideration of Clausius Clapeyron equation for vapor pressures of water and ice, instead of the exact vapor pressure relations, may produce errors in the prediction of the amount of water loss from the cells at high cooling rates only; the assumption of intact cells will produce considerable deviation in the prediction of water loss from the cells as compared to the more realistic assumption of shrinkable cells; the non ideality of protoplasm solution is very effective on the prediction of the amount of water loss from the cells; and the assumption of uniform temperature cells during the cooling process may be erroneous only for cells with small fractions of water in their protoplasms.

3019. Hydrodynamic conditions at the areas of deposition in the model of an artery branching - Kratzer M. and Kinder J. - Dept. Physiol., Neuherberg - PFLUGARCH.EUR.J.PHYSIOL. 1975 355/Sup. (No. 39)

In hydrodynamic experiments on tube branching, Baldauf et al. localized deposits of activated erythrocytes and thrombocytes. These depositions begin at flow rates considerably lower than those observed in constricted and curved tubes. In the experiment reported here, the hydrodynamic conditions in a right angled branch tube (main branch 3 mm, side branch 1.5 mm diameter) were investigated for a Reynolds number of roughly 300. Fluid streaklines were

made visible by illuminating a 100 μm thick longitudinal section of a flowing suspension of 5 μm tungsten acid particles with a stroboscopically pulsed Argon laser in a dark field mode. These streaklines yielded the velocity vector at the flow regions being investigated. It was found that at the areas of deposition, the flow is directed towards the wall. At the recognized deposits of erythrocytes, that is the dead water zone opposite to the orifice of the side branch, the velocity towards the wall is low, whereas this velocity is high at the areas of thrombocyte deposition, around the orifice.

3020. A combined left ventricular/systemic arterial model - Corey P.D., Wemple R.R. and Vander Werff T.J. - Colorado State Univ., Fort Collins, Colo. 80521 - *JBIOMECH.* 1975 8/1 (9-15)

A model mathematically coupling left ventricular performance and systemic arterial dynamics is described. This model demonstrates that these 2 previously separate areas can be brought into intimate quantitative contact. This model and its more sophisticated successors should provide a better understanding of the interaction between the heart and the arterial system, particularly when one or both of these is abnormal.

3021. The intracranial pressure. I. A theoretical study - LA PRESSION INTRACRANIENNE. I. ETUDE THEORIQUE - Benabid A.L., De Rougemont J. and Barge M. - *Serv. Neurochir., CHU Grenoble, La Tronche - J.PHYSIOL.* (Paris) 1974 68/6 (655-669)

Two hypotheses are put forward concerning intracranial vascular bed elasticity and the permeability of subarachnoid spaces to CSF. Monro Kellie's law is expressed in the form of a differential equation. A pressure flow relationship is the principal factor which determines the intracranial pressure.

3022. Spectral analysis and cross correlation techniques for photon counting measurements on fluid flows - Durrani T.S. and Greatest C.A. - *Electron. Dept., Univ. Southampton - APPLOPT.* 1975 14/3 (778-786)

Photon counting techniques for the measurement of turbulent fluid flows are analyzed, and it is shown that considerable errors can result if conventional Fourier methods are used to transform count correlation records from LDV systems onto the frequency domain. Two alternative schemes are presented that overcome this difficulty. The first involves the use of high resolution spectral techniques to transform count autocorrelation records, and the second makes use of the count cross correlation between signals from 2 detectors. A theoretical analysis is presented for the count cross correlation process, and experiments in air flow show turbulence levels predicted by the 2 methods to be in close agreement.

2.8. Electrical systems

3023. Analysis of point process signals applied to motor unit firing patterns. II. Superposition of

phase locked spike trains - Gath I. - *Dept. Med. Electron., Fac. Electr. Engin., Technion, Israel Inst. Technol., Haifa - MATH.BIOSCI.* 1974 22 (223-236)

The different possibilities of cross constraints between the firing patterns of a number of motor units are laid out. Correlated phasic activity is defined, and the effect of phase locking on the superposition of event sequences is investigated by the simulation model. For superposition of 4 spike trains, the 2 cases of phase locking investigated by the model $P = 0.25$ and $P = 0.0$ may represent an asynchronous and a synchronous motor unit activity, respectively. A filtering method for estimation of the phase, in cases of phase locked activity, is described.

3024. Analysis of point process signals applied to motor unit firing patterns. I. Superposition of independent spike trains - Gath I. - *Dept. Med. Electron., Fac. Electr. Engin., Technion Israel Inst. Technol., Haifa - MATH.BIOSCI.* 1974 22 (211-222)

The aim of the study was to examine whether statistical methods common for the analysis of point process signals could be applied to the electromyogram, in order to extract information concerning the physiological mechanisms involved. This was carried out on the assumption that the electromyogram can be treated as the superposition result of a number of point process signals, each representing the firing pattern of one motor unit. No correlated activity between the different spike trains was assumed at this stage. A digital model for the superposition of event sequences was constructed, assigning to the individual sequences a Gaussian interval distribution. The effects of varying the number of spike trains participating in the superposition process and changing the mean rates of firing were explored. The statistical methods used in the analysis were serial correlation, event autocorrelation, and power spectrum studies. It has been found that serial correlograms of the superimposed processes may be helpful in detecting the number of spike trains involved in the superposition, whereas power spectrum studies are useful in determining the mean rates of firing of the individual sequences.

3025. An interaction model of a Poisson and a renewal process related to neuron firing - Pooi A.H. and Lee P.A. - *Dept. Mathemat., Univ. Malaya, Kuala Lumpur - BIOL.CYBERN.* 1975 17/2 (71-76)

This paper discusses a neuronal model based on a model of Coleman and Gastwirth (1969). It is assumed that the excitatory input forms a Poisson process while the inhibitory input forms a stationary renewal process. The proposed interaction scheme is as follows: an inhibitor deletes at most N consecutive excitatory inputs and a response only occurs after the cumulative storage of M excitatory inputs. The Laplace transform of the probability density function of the interresponse intervals is derived together with results of the numerical inversions.

3026. A pressure vessel model for nerve compression - MacGregor R.J., Sharpless S.K. and Luttges M.W. - *Dept. Engin. Design Econ.*

Compression block in a nerve can be better interpreted in terms of a pressure vessel model for nerve fiber distension, than the more common models based upon tubes with more or less rigid walls. In this model, resistance to compression is due to the elasticity of the cell membrane at locations where displaced intracellular fluid tends to distend it. Because the stresses in pressure vessels increase with the size of the vessel, the hypothesis predicts that the percentage deformation should be larger in larger diameter fibers.

3027. Fluorescence risetime of NE 102 scintillator

- Campillo A.J., Hyer R.C. and Shapiro S.L. - Los Alamos Sci. Lab., Univ. California, Los Alamos, N.M. 87544 - NUCLINSTRUM.METH. 1974 120/3 (533-534)

NE 102 is excited with picosecond pulses at 0.353 μ m, and the onset of fluorescence is detected with a streak camera. The risetime of the fluorescence is measured to be ≤ 20 ps.

3028. Homogeneous nets of neuron like elements

- Amari S.I. - Fac. Engin., Univ. Tokyo - BIOLCYBERN. 1975 17/4 (211-220)

Propagation and reverberation of excitation patterns are investigated for 1 dimensional and 2 dimensional homogeneous nets of neuron like elements. A 1 dimensional net has a proper set of excitation patterns which only can be conducted in the net. Such a net has an ability of discriminating and shaping stimulus signals. Two types of self reproducing reverberatory excitation patterns are shown for 2 dimensional homogeneous nets. An algebraic theory of general homogeneous nets is also developed.

3029. Some properties of transmission lines composed of random networks - Shimura M. and Pask G. - Fac. Engin. Sci., Osaka Univ., Toyonaka - MATH.BIOSCI. 1974 22 (155-178)

Some properties are discussed of a nerve axon like transmission line made up from random networks of threshold elements. A random network contains a large number of threshold elements of which the threshold values are Gaussian random variables, and it can act as a monostable or a bistable multivibrator. The signal wave propagation in a transmission line is analyzed by a statistical method. The results show that a signal wave can propagate along the line and that its waveform is shaped, during propagation, into a specific form peculiar to this line. A self oscillatory system that consists of 2 random networks is also analyzed. Even in this simple system, various modes of oscillation can exist with periods varying over a wide range according to the values of system parameters. Examples of self oscillations obtained by a graphical method are presented and some results of computer experiments are shown.

3030. Compensation of edge effect in neuron like layer nets with local feedbacks - Macukow B. - Inst. Mathemat., Techn. Univ., Warsaw - ACTA NEUROBIOLEXP. (Warszawa) 1975 35/2 (165-177)

One or two dimensional layer nets with local feedback between neuron like elements

were investigated. The mutual influence between elements of the net is based on the principle of lateral inhibition. A properly adapted and modified Z transform method applied to a difference equation describing the function of the net allowed the author to characterize the properties and dynamics of the net and to define its stability region. Finite dimensions of the net cause 'reflections' of signals from the edges of the structure. This makes the detection of pattern difficult or even impossible and therefore the problem of compensation of the edge effects appears. Several methods of compensation, involving discrete or continuous change of coupling weights, are described. A comparison of the behavior of a compensated and uncompensated net, as modelled on a digital computer, shows the advantages of the compensation.

3031. Analogue simulator of e.e.g. signals based on spectral components - Zetterberg L.H. and Ahlin K. - Tekn. Hogsk., Stockholm - MED.BIOENGINEERING 1975 13/2 (272-278)

A model describing the spectral properties of EEG signals by a set of parameters has previously been introduced. It leads to a decomposition of the spectrum into one or more spectral components. The described EEG signal simulator is based on such a decomposition into one delta, and 3 rhythmic components called theta, alpha and beta denoting the location of the resonance peaks. Each component is generated separately with a noise generator and a spectral shaping filter. Care is taken to make the noise generator have a flat spectrum down to zero frequency. The spectral shaping filters are of an active type with a configuration that allows easy adjustment of poles and zeros. The use of the equipment is demonstrated by simulating 5 different EEG signals first by analysing the EEG, and then by setting the simulator to produce an identical spectrum.

3032. Application of fluctuation spectroscopy in neurophysiology (Dutch) - De Goede J. - Lab. Fysiol., Rijksuniv., Leiden - T.NED.ELEKTRON.RADIOGENOOTSCH. 1975 40/1-2 (23-29)

From an analysis of spontaneous fluctuations of a physical quantity ('noise'), information can be obtained about dynamic properties of systems. This fluctuation spectroscopy was used to study the kinetic processes in the nerve membrane. The measured power spectra under current clamp conditions consisted of several components. The different physical mechanisms which correspond to these components are discussed.

3033. Synthesis of boolean nets and time behavior of a general mathematical neuron - Caianiello E.R. and Grimson W.E.L. - Lab. Cibernet. CNR, Arco Felice - BIOLCYBERN. 1975 18/2 (111-117)

All neurotic equations proposed by Caianiello (1961) are completely linearized in tensor space, and all problems related to them are reduced to matricial relations, i.e. solved in principle in compact form. As a consequence, one obtains the general synthesis of an arbitrary

boolean net, from which the complete treatment of the general equations for a single mathematical neuron is easily derived. This formalism appears to be the natural tool for obtaining concise solutions to the many problems previously posed concerning neuronic equations.

3034. Current voltage curves of bimolecular lipid membranes - Luschow U.L., Heckmann K.D. and Pring M. - Lehrst. Chem. II, Univ. Regensburg - BIOCHIM.BIOPHYS.ACTA 1975 389/1 (1-12)

The first part of this paper describes the current voltage curves of bimolecular membranes of oxidized cholesterol formed between 2 aqueous solutions of tetrabutylammonium chloride. These membranes are selectively permeable for cations and the membrane interfaces are electrically uncharged. The dependence of the membrane conductivity on the membrane potential can be described as the product of the conductivity at zero current (zero conductivity) and a function called 'overlinearity'. The zero conductivity increases linearly with the concentration of tetrabutylammonium chloride. The overlinearity is independent of the concentration of tetrabutylammonium chloride. In the second part the Nernst Planck and Poisson equations are integrated numerically for a 3 phase system consisting of an aqueous electrolyte solution, a membrane and an aqueous electrolyte solution. Each phase is characterized by material constants. Appropriate boundary conditions cause the electric current to build up electrical double layers on both sides of the membrane. The opposing double layers with opposite electrical signs inject the soluble ions into the membrane. This ion injection accounts for the overlinearity of the current voltage curves, thus explaining the measured characteristics.

3035. Factorization of Fourier and Laplace transforms as a basis of the fast Fourier transform - Carroll J.E. - Dept. Engin., Univ. Cambridge - INT.J.ELECTRON. 1975 38/2 (265-269)

A mechanistic method of finding the next step in an arbitrarily large fast Fourier transform at an arbitrary stage is outlined. The method starts by writing down 2 different forms for the discrete Fourier transform of a sampled function and converting one into the other by decomposition using partial fractions. The process demonstrated corresponds to decimation in time. The alternative of decimation in frequency is demonstrated through an analogous procedure using the Laplace transform of a sampled function. It is suggested that the method should help in understanding the organization of a large scale FFT.

2.9. Nuclear biophysics

3036. Muon shielding around high energy electron accelerators. Part theory theory - Nelson W.R. and Kase K.R. - Stanford Linear Accelerator Cent., Stanford Univ., Stanford, Calif. 94305 - NUCLINSTRUM.METH. 1974 120/3 (401-411)

The production of muons from a high energy electron linac is calculated using the

latest cross section theory. The shielding of these muons is calculated using the Fermi Eye's multiple scattering formulation. The effect of various approximations in the calculations is discussed. A comparison is made between theory and experiment, and reasonable agreement is obtained in the forward direction. The experiment gives a significantly higher value for the absorbed dose, as compared with theory, for locations off the production axis. This is believed to be due to a background component in the total dose measured, and suggests the need for further experimentation with emphasis on fluence (as well as absorbed dose) measurements, at distances far from the axis.

3037. Dangers and problems in calculating coefficients of a sum of exponential functions - Bietry J.C., Martin J., Depaix M. and Monot C. - Sect. Informat. Med., Groupe INSERM U CXV, Univ. Nancy - BIOMEDICINE 1975 22/1 (70-76)

The use of the computer in making calculations has led increasingly to the estimation of parameters of exponential functions from point experimental measurements. This involves the use of techniques such as logarithmic transformations and criteria (especially that of the least squares), of which the use is not always justified. Radioactivity measurements raise special problems as they are subject to a statistical distribution of the Poisson type. The authors propose a method based on the statistical criterion of maximum likelihood which permits tests of the number of exponentials from point measurements (in practice, this method is valid for one or two exponentials), and also the calculation of parameters more satisfactorily than customary methods.

3038. Competitive binding assays. Part I Chemical considerations - Miller W.W. and Quint J. - Beckman Instrum. Inc., Irvine, Calif. - LAB.EQUIPM.DIG. 1974 12/12 (23-25)

Radioimmunoassay and competitive protein binding assays were first reported in 1960. Since that time, these types of assays have become a powerful tool for the detection of many physiologically important compounds. This article reviews the theory of radioimmunoassay, the production of assay components, the optimisation of component concentrations, and data reduction methods.

3039. Some classes of hit theory models - Turner M.E. Jr. - Div. Biophys. Scis, Dept. Biostatist., Univ. Alabama, Birmingham, Ala. 35294 - MATH.BIOSCI. 1975 23/3-4 (219-235)

The quantum biological theory of the interaction (hits) between radiation particles and targets necessary for survival was axiomatically developed. Extensions, to include both biological variability in the probability of a hit and variation in the number of targets, were carried out. The problem of adjustment for spontaneous death was explicitly treated by zero truncation of relevant distributions. A catalog of 39 models is presented in 3 tables, many being new. The problem of aliasing of models resulting from different assumptions is briefly treated. An operational approach to hit theoretic modelling is

presented. The notion of a principle of duality is used to explicate the relation between continuous tolerance dose distributions and quantal dose mortality curves. Implications for the theory of bioassay are pointed out. The compendium of hit theory models should enable the biological investigator to choose an appropriate model for a particular investigation and aid awareness of a set of alternative models which may be consistent with experimental data.

3. GENERAL INSTRUMENTATION

3040. Gas sterilization for medical purposes

(Polish) - Wegrzecki T. - Zespolu Opieki Zdrowotn., Lublin - PROBLTECHN.MED. 1974 5/4 (411-414)

Salient problems of sterilization with ethylene oxide and formaldehyde vapors are surveyed. There is a need to define the direction of further development of sterilization techniques on a national scale.

3041. Sterilization of medical apparatus with

ethylene oxide (Polish) - Matuszczak S. - Poznan. Zakl. Farmaceut., Wydz. Nici Chir., Poznan - PROBLTECHN.MED. 1974 5/4 (385-389)

The parameters of temperature, concentration, desiccation, constitute factors influencing the bactericidal efficacy of ethylene oxide in sterilization processes. Control in this field consists in physical evaluations and bacteriologic tests. The physical evaluations demonstrate the need to control the amount of ethylene oxide, water or steam, to maintain an adequate temperature and to control the initial vacuum and then the pressure during exposure. It was demonstrated that in order to provide suitable humidity it is necessary to air condition the materials before sterilization and to test the degree of desorption of ethylene oxide after sterilization. Aspects of chemical indicators in the form of bags or adhesive strips are examined.

3042. Efficacy of ethylene oxide sterilization of

plastic products for medical purposes, in Czech apparatus (STE68) and German apparatus (Degesch) (Polish) - Sniezynska I., Kucharzewski M., Fidecki M. and Sniezynski J. - Lubelsk. Zakl. Farmaceut. Polfa, Lublin - PROBLTECHN.MED. 1974 5/4 (375-383)

Ethylene oxide sterilization of medical items is discussed. The initial examinations of sterilization efficiency were done on a Czech apparatus (STE68) using 10% ethylene oxide under pressure. The effect of the type of sterilized articles upon the absorption of ethylene oxide and the dependence of gas desorption on the time of ventilation were examined. Favorable results were obtained with vacuum sterilization by means of 90% ethylene oxide in a German apparatus.

3043. Ethylene oxide in gas sterilization (Polish) -

Borucka J. and Swedrowska E. - Cent. Osr. Techn. Med., Warszawa - PROBLTECHN.MED. 1974 5/4 (367-374)

Literature data are cited to indicate the

properties and possibilities of adoption of ethylene oxide as a sterilizing agent. The basic parameters of the sterilization process and the trends of research required in order to reach full effectiveness of this sterilization technique of medical equipment are surveyed.

3044. A hot air curtain for heating an ambulance - Snook R. - Accident Ambul. Res., Crossways Farmhouse, Dunkerton, Bath - RESUSCITATION 1974 3/2 (151-153)

A simple 'hot air curtain' for minimizing the cooling of ambulances when the doors are opened is described.

3045. Development of a gross pollution detector -

Stroud K.C.G. and Jones D.B. - Water Supply Div., Birmingham - POLLUTMONIT. 1975 No.22 (13-15)

This paper describes the results of studies on a series of rivers with a gross pollution detector, an instrument which operates upon the interference with the bacteriological oxidation of ammonia in a nitrifying column caused by substances toxic or inhibitory to the bacteria. The studies had three main purposes: to identify and try to overcome the problems associated with the use of the detector on actual river sites; to find out if the detector could be developed into a reliable plant which could be installed easily at any station, and to obtain an insight into its use on rivers carrying a range of pollution loads. The instrument was found to be reasonably reliable, although it required some regular maintenance. In addition, the instrument could be developed to detect gross pollutions on poor quality rivers but more sophisticated electronic equipment would be needed if a warning signal were required, as this would have to depend for its activation upon ammonia removal efficiency and not the residual ammonia in the nitrifying column effluent.

3046. Towards quantitative scanning electron

microscopy - Heywood J.A. - Philips Anal. Dept., Pye Unicam Ltd., Cambridge - MICROSCOPE 1975 23/1 (47-53)

Quantitative scanning electron microscopy includes sample dimensions, composition and factors affecting image brightness. Most scanning electron microscopes can, with elaborate precautions, measure the factors affecting brightness, such as surface voltage, beam induced conductivity, cathodoluminescence, crystallography and mean atomic number. The Philips PSEM 500 combines quantitative operation, extreme versatility and ease of use.

3047. Microbial isolators for use in the hospital -

Trexler P.C. - Roy. Veter. Coll., London - BIO-MED. ENGINEERING (Lond.) 1975 10/2 (63-67)

Isolators made of flexible transparent plastic film maintain a physical separation between clean and dirty areas without interfering with the use of the isolated space. The reliability with which isolators maintain sterility has been demonstrated by the germ free rearing of the common laboratory and domestic animals. Isolators are used routinely in orthopaedic surgery for protecting patients who have severe congenital immune deficiency disease or are made infection prone because of therapy.

3048. New methods for surface ultrastructure: comparative studies of scanning electron microscopy, transmission electron microscopy and replica method - Hashimoto K. - VA Hosp., Memphis, Tenn. 38104 - INTJ.DERM. (Philad.) 1974 13/6 (357-381)

The use of a combination of transmission electron microscopy, scanning electron microscopy, replica methods and freeze fracture or freeze etching techniques tremendously widened the scope of dermatological research. In this report some of the interesting observations made recently are reviewed and discussed.

3049. A simple technique for making Diazochrome slides as teaching aids - Tanaka H. - Ohio State Univ. Coll. Dent., Columbus, Ohio 43210 - J.PROSTHET.DENT. 1975 33/3 (345-350)

Color pictorial slides are important for the learning process. They present a method which allows easy recognition of the subject without any effort to understand and appreciate it. A technique for the production of Diazochrome film for titles, charts, graphs, and diagrams is described. These slides are easy to produce, inexpensive, and time saving.

3050. A simple device for measuring angles without marking the radiographic film - Kuhns L.R. and Martin A.J. - Div. Ped. Radiol., C.S. Mott Child. Hosp., Univ. Michigan Med. Cent., Ann Arbor, Mich. 48104 - RADIOLGY 1975 115/1 (220-221)

Measurements of angles in radiology can be made without marking the radiographs when a simple modification of a standard goniometer is used. This is especially suitable for measuring scoliotic angles.

3051. Rapid determination of the molecular weight of diverse macromolecules from diffusion and viscosity measurements - Jamieson A.M. and McDonnell M. - Univ. Calgary - BIOPHYSJ. 1975 15/2(II) (320A)

The translational diffusion coefficient and the intrinsic viscosity of a macromolecule are related to the hydrodynamic volume through the Stokes Einstein relation and the Einstein Simha equation, respectively. Correlation of these 2 volume measurements permits a determination of the macromolecular weight. Diffusion coefficients of macromolecules can be measured in a few minutes by quasielastic laser light scattering. Classical methods are used to measure viscosity. For well characterized natural and synthetic macromolecules in different solvents a plot of MX $MnIn$ as a function of $D'n/T$ (where M is the molecular weight; In , the intrinsic viscosity; D' , the diffusion coefficient extrapolated to zero concentration; n , the solvent viscosity; and T , the temperature) provides a nearly universal curve; the goodness of the solvent enters only weakly. This plot permits a quick method for determining the molecular weight of fairly monodisperse fractions of macromolecules or complexes. The procedure is used to find the molecular weight of polysaccharides and native and denatured proteins.

3052. Remodeled von Ardenne Westmeyer's

ultramicrotome for the trimming of pyramidal sections - UMGEBAUTES ULTRAMIKROTOM NACH V.

ARDENNE WESTMEYER ALS PYRAMIDENTRIMMGERAT - Von Mickwitz C.U., Gaertner H. and Zantow K. - Abt. Biol. Ultrastrukt. Forsch., Akad. Wissensch. DDR, Berlin Buch - Z.MED.LABORTECHN. 1975 16/1 (16-20)

Two alternatives for converting this microtome are presented. They allow the preparation of orientating sections and pyramids with no need for another specimen holder for subsequent ultramicrotomy.

3053. A microtome for the production of sections of untreated cartilage - EIN MIKROTOM ZUM

HERSTELLEN NATIVER KNORPELSCHNITTE - Hanschke M. and Heilmann H.H. - Lab. Pathophysiol. Knochen, Orthop. Klin., Univ. Greifswald - Z.MED.LABORTECHN. 1975 16/1 (42-43)

A reconstructed microtome for serial sections is described, which, without fixation and embedding, enables realization of the sections of native cartilage of given dimensions.

3054. Improved large volume sampler for the collection of bacterial cells from aerosol - White L.A., Hadley D.J., Davids D.E. and Naylor R. - Def. Res. Establishm. Suffield, Ralston - APPL.MICROBIOL. 1975 29/3 (335-339)

A modified large volume sample was demonstrated to be an efficient device for the collection of mono disperse aerosols of rhodamine B and poly disperse aerosols of bacterial cells. Absolute efficiency for collection of rhodamine B varied from 100% with 5 μm particles to about 70% with 0.5 μm particles. The sampler concentrated the particles from 950 liters of air into a flow of between 1 and 2 ml of collecting fluid per min. Spores of *Bacillus subtilis* var. *niger* were collected at an efficiency of about 82% compared to the collection in the standard AGI 30 sampler. In the most desirable collecting fluids tested, aerosolized cells of *Serratia marcescens*, *Escherichia coli*, and *Aerobacter aerogenes* were collected at comparative efficiencies of approximately 90, 80 and 90%, respectively. The modified sampler has practical application in the study of aerosol transmission of respiratory pathogens.

3055. A solid state iontophoretic current switch - Blunn R.W. and Brown T.A. - MRC, Neuropharmacol. Unit, Med. Sch., Birmingham - ELECTROENCEPH.CLIN.NEUROPHYSIOL. 1975 38/5 (527-529)

The switching of high voltages to produce constant currents for microiontophoresis, using solid state devices and the control of such switches automatically, can be accomplished inexpensively, by the current switch described.

3056. Transitional Butterworth Legendre filters - Rakovich B.D. - Fac. Electr. Engin., Univ. Belgrade - RADIO ELECTRON.ENGINEER 1974 44/12 (673-680)

A new class of monotonic passband low pass filters, referred to as transitional Butterworth Legendre (TBL) filters, is introduced. The closed form expressions of the characteristic functions of these filters, depending on one variable parameter q , are derived by generalization of the results previously obtained for Legendre sharp cut off

monotonic filters. The parameter q , the values of which are restricted to non negative integer values ($q \leq n$), controls the number of flatness conditions in the magnitude response at the origin, and enables a trade off between the passband loss and the stopband attenuation of the resulting filters. The Legendre, Halpern and Butterworth filters are shown to be special cases of TBL filters. Only all pole filter functions are discussed, although the results can easily be extended so as to include low pass filters with finite, real frequency transmission zeros.

3057. A presettable multichannel digital timer - Sabah N.H. - Electron. Lab., Dept. Electr. Engin., Amer. Univ., Beirut - JAPPLPHYSIOL 1975 38/4 (757-759)

A digital timer is described which generates a number of pulses whose delays with respects to a periodic reference pulse can be independently preset by means of thumbwheel switches. The timing intervals are crystal controlled and can be varied over a wide range typically 0.1 ms to 99.99 s. It is shown how a pulse train of up to 46 pulses may be obtained, the delay of each pulse in the train being individually presettable. Digital integrated circuits are used throughout, except for the output stage of enhanced drive capability.

3.1. Transducers

3058. Investigations of electret as a contamination control device - Pillai P.K.C., Su C.S. and Shriner E.L. - Space Sci. Lab., NASA, Marshall Space Flight Cent., Huntsville, Ala. 35812 - ENVIRONM.LETT. 1974 7/3 (261-266)

It has been found that thermoelectrets of polymers with stable surface charge on either side are suitable devices to attract charged particles and ions to their surfaces for a long time. It was therefore decided to use these electrets for effectively controlling the contaminations in the form of gases, vapors, or particles in the atmosphere. This paper reports the results of a systematic study of the thermoelectret characteristics of the polytetrafluoroethylene (teflon) electret. Stable thermoelectrets with known surface charges and fields were used to collect vapors of xylene and acetone under different experimental conditions. These collected vapors on electrets were then analyzed by taking the mass spectra of the sample. The results show that vapors present in the atmosphere as contaminations can be effectively collected over the electret surface and the presence of such contaminations on the electret can be detected by mass spectrometric method.

3059. Low frequency noise spectrum and its current dependence for photoresistors based on p type indium antimonide - Losev V.V. - SOVJ.OPT.TECHNOL 1974 41/4 (201-202)

The noise spectrum of photoresistors was studied experimentally in the range 0.5 Hz to 50 kHz. The measurements were made at 77° K. The current dependence of the noise, measured at low

and ultralow frequencies, corresponds to an exponential function with an exponent greater than two.

3.2. Amplifiers

3060. Time domain difference amplifier - Hidaka T. - Electrotechn. Lab., Tanashi shi, Tokyo - REV.SCLINSTRUM. 1975 46/2 (152-154)

This paper describes a new electronic circuit, the time domain difference amplifier, used to reduce strong drifts which bury weak repetitive signals. The principle is that the input, with signal and drift, is sampled at signal on and signal off states, and subtracted from each other. The random drift is reduced by integrating the subtracted values. Drift suspension is about 35 dB for 3.0 Hz ac drift and 100 repeatings for integration.

3061. A voltage controlled filtering technique - Minkow B. and Lopez Toledo A.A. - Harvard Business Sch., Harvard Univ., Cambridge, Mass. 02138 - INT.J.ELECTRON. 1975 38/1 (117-126)

An approach to voltage controlled filtering is presented in this work. The method is based on a linear system with periodically operated synchronous switches. Digital simulation results are presented, and compared with those obtained via a hardware implementation of the filter. The simplicity of the approach makes the filter attractive for a variety of applications.

3062. An optimum phase locked loop with a non ideal filter - Ahmed N.U. and Cheng P.H.W. - Fac. Sci. Engin., Electr. Engin., Univ. Ottawa - INT.J.ELECTRON. 1975 38/3 (331-336)

In communications engineering, the problem of synchronization is vital. Any loss of synchronization must be restored in the shortest possible time. The concept of optimum PLL (phase locked loop) which utilizes a non linear, memoryless feedback device was introduced by Ahmed and Cheng. It was shown that this optimum PLL achieves synchronization in the minimum time if the filter were ideal. This paper considers the optimization of the PLL with a non ideal filter. The input sinusoid and the VCO output are assumed to have the same frequency, but to differ in phase. The object of this paper is to investigate whether the optimum PLL introduced earlier, still retains its virtues when the ideal filter is replaced by a non ideal one. The non linear Volterra integrodifferential equation governing the PLL performance is solved by 2 different approaches, and the solution indicates that the PLL in the presence of a non ideal filter is optimal only within a certain range of variation of the parameter defining the non linear device.

3063. Unbalanced active realizations of non minimum phase RC voltage transfer functions: A simple approach - Rathore T.S. and Dasgupta S.M. - Dept. Electr. Engin., G.S. Inst. Technol. Sci., Indore - INT.J.ELECTRON. 1975 38/3 (349-351)

An earlier method for passive realization of non minimum phase RC voltage transfer

functions is simplified and extended to a class of active RC unbalanced realizations.

3064. Inductor realization with resistive feedback in RC filters - Patranabis D. - Dept. Instrumentat. Electron, Jadavpur Univ., Calcutta - INTJ.ELECTRON. 1975 38/3 (367-374)

Resistive feedback in active RC first order filter sections realizes an inductor at the input port. The realized form may be ideal, real or bilinear in nature, depending on the type of the filter. The method was proposed though a semi synthetic approach, and a few practical schemes are appended with appropriate comments. Different schemes are compared in a table for performance evaluation of the realized inductors.

3065. Inductor realisation using a finite gain differential amplifier - Subba Reddy B. and Krishnan V. - Dept. Electr. Engin., Indian Inst. Sci., Bangalore - INTJ.ELECTRON. 1975 38/3 (423-427)

A finite gain differential amplifier is used along with a few passive RC elements to simulate an inductor. Methods for obtaining low Q inductance and frequency dependent high Q inductance are described. Sensitivity analysis, when the gain varies, is also included.

3066. Phase locked loops - Gupta S.C. - Inst. Technol., South. Methodist Univ., Dallas, Tex. 75275 - PROCIEEE (NX) 1975 63/2 (291-306)

An attempt to systematically outline the work done in the area of phase locked loops which are now used in modern communication system design is presented. The analog phase locked loops are well documented in several books, but discrete, analog digital, and digital phase locked loop work is scattered. Apart from discussing the various analysis, design, and application aspects of phase locked loops, a number of references are given in the bibliography.

3067. A current controlled two terminal negative resistance network - Al Charchafchi S.H. and Dehnavi F.A. - Electr. Engin. Dept., Coll. Engin., Univ. Riyadh - INTJ.ELECTRON. 1975 38/2 (271-274)

A 2 terminal network which behaves as a current controlled linear negative dynamic resistance of adjustable magnitude is described. For a 'zero' resistance state, the characteristic is similar to that of a Zener diode with a controllable Zener voltage.

3068. An active RC realization of a bilinear RL impedance - Natarajan S. - Dept. Electr. Engin., PSG Coll. Technol., Coimbatore - INTJ.ELECTRON. 1975 38/2 (279-282)

Various schemes of realizing an inductor have been proposed in the literature, which use active elements other than gyrator and RC elements. They realize either a bilinear RL impedance in a specified frequency range, or a linear RL impedance of a single port. Here is a scheme to realize a bilinear RL impedance, which employs an inverting VCVS of finite gain. The sensitivity figures with reference to the active and passive parameters are seen to be finite and low values.

3069. An active filter using equal valued earthed capacitors - Rathore T.S. and Dasgupta S.M. - S.G.S. Inst. Technol. Sci., Indore - INTJ.ELECTRON. 1975 38/2 (283-286)

A new active filter circuit is introduced which uses only 2 grounded capacitors of equal value and is shown to be capable of realizing most of the second order RC voltage transfer functions while maintaining isotropic structure. It is superior to the realization obtained by the method of Dutta Roy using one inverting amplifier.

3070. Sub ohm voltage variable resistance using MOSFET's - Barker R.W.J. and Hart B.L. - Dept. Electron. Electr. Engin., Univ. Sheffield - INTJ.ELECTRON. 1975 38/2 (247-251)

The interconnection of a field effect transistor operated in the 'pre pinch off' region, and a standard operational amplifier working in the 'inverting' mode, facilitates the achievement of a low value (e.g. < 1) voltage controllable resistance, which is particularly useful as a fine adjustment potentiometer in precision measurement systems.

3071. A voltage controlled variable resistance MOSFET - Sitaram R.S. and Townsend W.G. - Dept. Electr. Electron. Engin., Univ. Coll., Swansea - INTJ.ELECTRON. 1975 38/2 (253-257)

A method of making a composite p channel enhancement MOSFET with an extended range of controllable channel resistance variation is described. The integrated device uses a number of parallel connected MOSFET's having different aspect ratios with the gates supplied from potentials derived from tapping points on a diffused resistance chain. A log linear variation of channel resistance is achieved over a range from 300 to 200 k for a gate voltage variation of 28 to 4 volts. The departure from linearity is 10%. The composite devices are made using a standard p channel metal gate MOS process.

3072. The synthesis of RC active filters using finite gain amplifiers - Saha S.K. - Electr. Engin. Dept., Coll. Technol., Pantnagar, Nainital - INTJ.ELECTRON. 1975 38/2 (241-245)

The paper presents a synthesis procedure for realizing RC active filters using non zero finite gain amplifiers. The pole sensitivity of the transfer function can be minimized by RC-RL decomposition.

3.3. Indicators

3073. Digital positioning on a viewing screen - DIGITALE POSITIONIERUNG AUF DEM BILDSCHIRM - Gidl G. - Inst. Elektron., Techn. Hochsch., Graz - ELEKTRONIK 1975 24/1 (61-66)

The Technical University in Graz has produced an evaluation equipment which arranges points marked on a TV screen with a light pen into a coordinate system and then enables their evaluation. The system is suitable as an inexpensive, audio visual teaching aid for programmed instruction, but could also be used for control applications in industry. The article

includes fundamental information on data display terminals, on a simple positioning system, the light pen, and on the design and use of the coordinate recorder.

3074. Flat screen video - Editorial - BELL LAB.REC. 1975 53/3 (175)

A flat screen video display that can be used to transmit handwriting, reproduce pictures, or communicate with a computer was demonstrated. The display employs a panel of thousands of small glass cells that light up selectively on command from a signal, thereby producing an image. Still in the experimental stage, the display may eventually be used for visual communication between people, and between people and machines.

3.5. Generators

3075. A dynamic admittance meter based on a voltage controlled oscillator IC - Budding R.W. and Strackee L. - Radiat. Res. Lab., Nat. Inst. Publ. Hlth, Bilthoven - REV.SCI.INSTRUM. 1975 46/2 (210-212)

A simple and versatile admittance meter is described, which is built around a commercially available voltage controlled oscillator (VCO). The instrument measures the real and imaginary part of an unknown admittance separately in the frequency range from 1 kHz up to 1 MHz. A compensating admittance can be inserted in order to improve the precision of the measurement. The accuracy of the instrument is estimated as better than 3%.

3076. A novel form of diffusion battery - Sinclair D. and Hoopes G.S. - Hlth Safety Lab., US Atom. Energy Comm., New York, N.Y. 10014 - AMER.INDUSTR.HYG.ASS.J. 1975 36/1 (39-42)

A novel form of diffusion battery uses a series of 635 mesh screens, instead of the customary cluster of circular tubes or holes. 55 Screens are arranged in series, so that the amount of aerosol penetrating through different numbers of screens can be measured with a condensation nuclei counter. This filter stack must be calibrated, because theory is not available to calculate the performance of such screens with sufficient accuracy. For calibration, a polydisperse aerosol such as ambient or silver aerosol is used to compare the performance of the screens with that of the cluster tube and collimated holes diffusion batteries, whose performance is known from theory. It was observed that a given number of screens is equivalent to a given number of batteries, independent of the size or size distribution of the aerosol. This filter stack is very compact and light in weight (0.9 kg). It is particularly useful for measurements in the field.

3077. Power supplies for complementary m.o.s. circuitry - Blandford D. and Bishop A. - RCA Ltd., Solid State Europe, Sunbury on Thames - ELECTRONICS POWER 1975 21/4 (247-248)

Two of the major advantages of complementary m.o.s. integrated circuit logic

systems are their low power dissipation, and their ability to operate over a wide range of supply voltages. These features permit their use with simple, small, low cost power supplies.

3078. Static invertors for A.C. power supplies - Start J.D.M. - High Voltage Engin. Div., Brandenburg Ltd., Thornton Heath - ELECTRONICS POWER 1975 21/4 (241-243)

Static invertors are increasingly attracting interest as a reliable and economic means of providing a.c. supplies, both in industry, and for aircraft and marine applications. This article reviews the present status of static invertors, and discusses the economic considerations involved in their use.

3079. Magnetic stabilisers meet need for regulation and transient suppression - Driscoll J.W. - Pye Unicam Ltd., Cambridge - ELECTRONICS POWER 1975 21/4 (244-246)

As far as electronic equipment is concerned, probably the two most significant types of mains disturbance are transients and high frequency fluctuations. Both of these can be suppressed by magnetic stabilisers.

3080. A modern loose locked digital frequency synthesizer - Stringer D.V. - MARCONI REV. 1974 37/195 (181-208)

This article explains the theory and practical realization of a loose locked digital synthesizer, for use in high frequency communications equipment. The control loop is analysed in detail, and although the practical realization is governed to some extent by the requirements of a particular communication system of very high performance, the theory may be applied to any similar loose locked system.

3.6. Telemetric devices

3081. Ergospirometry and cardiac telemetry associated for the determination and control of resistance work during swimming - Deroanne R., Leloup M., Pirnay F. and Petit J.M. - Inst. E. Malvoz, liege - BIOTELEMETRY 1974 1/3 (157-170)

The association of the results obtained during ergospirometric tests in the laboratory with telemetric heart rate recordings during fractionated trainings of young male and female competitive swimmers enabled the confirmation in detail of the excellent physical fitness of these subjects; confirmation of the fact that the level of physiological solicitation is higher with use of a treadmill than with use of other ergometers; verification of the underestimation of the tolerance of a long duration exercise by the determination of the oxygen uptake corresponding to a heart rate of 170 beats/min on young and well trained subjects: A more accurate measurement of the ability to endurance is obtained by the determination of the maximum steady state. The excellent correlation between the maximum steady state and the transition between endurance and resistance work is discussed. Recordings were made during fractionated training of higher heart rates than

those usually found in swimmers in the literature, and the importance of the telemetric heart rate recording to characterize the training level of swimmers was confirmed.

3082. Ergospirometry and cardiac telemetry associated for the determination and control of resistance work during swimming - Deroanne R., Leloup M., Pirnay F. and Petit J.M. - Inst. E. Malvoz, Liege - BIOTELEMETRY 1974 1/3 (157-170)

The association of the results obtained during ergospirometric tests in the laboratory with telemetric heart rate recordings during fractionated trainings of young male and female competitive swimmers allowed: to confirm in detail the excellent physical fitness of these subjects; to confirm the fact that the level of physiological solicitation is higher with use of a treadmill than with use of other ergometers; to verify the underestimation of the tolerance of a long duration exercise by the determination of the VO_2 170 on young and well trained subjects; a more accurate measurement of the ability to endurance is obtained by the determination of the maximum steady state; to make conspicuous the excellent correlation between the maximum steady state and the transition between endurance and resistance work; to record during fractionated training higher heart rates than those usually found in swimmers in the literature, and to prove the importance of the telemetric heart rate recording to characterize the training level of swimmers.

3083. Investigations concerning the influence of hypoxia and hyperoxia on the cardiothoracic telerheogram and the rheoencephalogram in aviators - Filcescu V., Pintilie I., Stoian M. et al. - Aeronautical Med. Cent., Bucharest - BIOTELEMETRY 1974 1/3 (147-156)

An investigation was carried out in a group of 18 healthy student aviators aged between 18 and 21 yr old. They were tested by means of the telemetric system developed by Vrancianu, at ground level and at an altitude of 5,500 m in a barochamber over a 20 min period. In the last 5 min each subject inhaled 100% oxygen through a mask. Results show that the cardiocirculatory adaptation under these conditions occurs both by a prompt reaction of the heart rate and of other known parameters and also by significant variations of the electromechanical systole, of the total ejection time and, to a lesser extent, of the duration and amplitude of the rapid systolic ejection.

3084. A more than 4 percent efficiency solid state transmitter for a 4 GHz radio relay - Kitahara Y., Kyuzaki T. and Tamura R. - Microwave Satellite Communicat. Div., Nippon Elect. Co. Ltd., Yokohama - IEEE TRANS. MICROWAVE THEORY TECH. 1974 MTT-22/12 (1305-08)

An FM transmitter having 220 mW output power and 5 W total dc input power and operating in the 4 GHz band has been developed. This transmitter provides a dc to RF signal conversion efficiency of more than 4%. Featuring low power consumption and high reliability, this transmitter is suitable for use as a transmitter or an exciter for radio relay of a maximum of 1380

channels.

3085. From measuring point to measuring setup with telemetry - MIT TELEMETRIE VOM MESSPUNKT ZUM MESSPLATZ - Machule B. - ELEKTRONIK 1975 24/3 (72-79)

This article concerns itself with analog and digital transmission methods in industrial measurements, and with the storage of measured values on analog tape recorders. In opposition to FM techniques, PCM is now making its way to the front, since it offers, for example, the following advantages: a higher number of channels, greater dynamic range, faultless transmission and computer compatibility. The main disadvantage is the relatively low frequency bandwidth. With a low number of channels and high measuring frequency, FM is still seen to be of advantage. The article enables comparison of the systems, and provides a survey of themarked.

3086. Adaptive companding differential pulse code modulation for speech signal transmission - ADAPTIV KOMPANDIERENDE, DIFFERENTIELLE PULSCODE MODULATION ZUR UBERTRAGUNG VON SPRACHSIGNALEN - Widmer W. - PHILIPS RES.REPSUP. 1975 29/8 (1-90)

A new concept of adaptive differential pulse code modulation (ADPCM) for speech signal transmission is described. The basis of this new method is given by predicted information content derived from the most recent samples of information transmitted. Redundancy in the transmitted signal is thus reduced as compared with normal DPCM methods. No additional information need be transmitted to control the adaptive parameters of the decoder, provided the channel is free from interference. A method to recover synchronisation between transmitter and receiver after a transmission error or a channel interruption is included in the system. The characteristics of the system simulated with a digital computer were compared with those of a simulated normal companding PCM system. A speech signal of 250 sec duration was used as a test input at identical rates of transmission. Depending on the system load an improvement of up to 18 dB signal to quantizing noise ratio was obtained using the adaptive companding DPCM method. For the practical implementation of the ADPCM system, a novel encoder decoder with an adaptive compander is proposed. The circuit allows the exclusive use of digital integrated circuits.

3.8. Cameras

3087. Light distribution indicatrices at the exit from a bundle of light conductors - Gryaznova I.P., Konaeva G.Ya., Sattarov D.K. et al. - SOV.J.OPT.TECHNOL. 1974 41/4 (208-210)

Light distribution indicatrices at the exit from fiber optic elements having different thicknesses of light insulating layers between the light conducting strands, were measured for incidence of a narrow, pencil of rays directed on the entrance.

3088. A double field projector - Gavrilkin A.A. -

A double field projector for observing direct images of two objects is described. The double field image is obtained by the superposition of two optical arms, in which the halves of the intermediate images are masked by field stops.

3089. Imaging properties of Selfoc fibres -

Bhushan J. - Instrum. Res. Developm. Establishm., Dehra Dun - OPTICA ACTA 1975 22/3 (211-219)

Third order monochromatic aberrations for Selfoc fibers of different inhomogeneity were calculated. The image quality for various apertures and obliquities is predicted. The effect of various parameters in the design of Selfoc fiber is also discussed. Geometrical MTF was calculated, and the limit of resolution determined.

3090. Two dimensional image encoding by

combining one dimensional Hadamard transformation and differential pulse code modulation (Dutch) - De Brouwer J.A.M., Rooyackers J.E. and Strato R.C. - Techn.

Hogesch, Eindhoven -

TNEDELEKTRON.RADILOGENOUTSCH. 1974 39/5-6 (169-177)

The Hadamard transform has been utilized in several transform image encoders. This paper describes a real time encoding system, wherein one dimensional Hadamard transformation is combined with differential pulse code modulation (DPCM). The DPCM part operates on the transformed image by taking advantage of vertical correlation between corresponding coefficients. This gives a 2 dimensional encoding system without the need of complicated techniques as required by most other methods.

3091. Electron microscope specimen tilt stage -

Andrew R. - Dept. Electr. Engin., Univ. Salford - J.PHYS.E.SCIENT.INSTRUM. 1975 8/4 (265-266)

The principles of operation of an electron microscope specimen tilt stage are described. A stage using these principles has been constructed and permits tilt to an angle of 17.5° about any chosen axis in the specimen plane.

3092. Moire topography - Chiang O. - Inst. Phys., Acad. Sinica, NanKang, Taipei - APPL.OPT. 1975 14/1 (177-179)

Using geometrical optics, an oblique shadow method is shown to generate moire patterns which, under specific conditions, can be interpreted as contour lines of the surface. The oblique shadow method consists of illuminating a viewing grid with equal spaced parallel lines. The light can be either a point source or parallel light, the observation point can be either at finite distance or at infinity. Conditions for which moire patterns become contour lines of the surface are given.

3093. Signal to noise ratio and contrast in the

image by hologram storage - Galpern A.D. -

OPT.SPECTROSC. 1974 37/5 (550-553)

Expressions were derived to evaluate the signal to noise ratio and contrast in the image of an object observed through a scattering medium using storage methods. 2 Storage methods were considered: the method of image intensity storage, and the method of image storage taking

account of amplitudes and phases (method of hologram storage). It is shown that under any conditions, the method of hologram storage wins over the method of image intensity storage. Expressions to determine the extent of this advantage are derived and analyzed.

4. COMPUTERS

4.3. Digital

3094. The programmable pocket calculator seen in practice - DER PROGRAMMIERBARE TASCHENRECHNER IN DER PRAXIS - Goessler R. - ELEKTRONIK 1975 24/1 (80-82)

In the model HP 65 the company of Hewlett Packard has brought out a pocket calculator that thanks to its programmability opens up completely new areas of application for miniature calculators. Taking an example from the work of an electrical engineer, the processing of a program is explained and an impression conveyed of the capabilities of this versatile piece of equipment.

3095. A digital generator for pattern drawing

applications - Crawford D.O., Hale R.J. and Nichols K.G. - Dept. Electron., Univ. Southampton - RADIO ELECTRON. ENGINEER 1975 45/1-2 (75-79)

The generator may be used off line or on line to a computer. It is used principally for integrated circuit mask generation, but is also suitable for other precision pattern drawing applications. The generator accepts commands to draw line segments, to outline or scan rectangles, and to replicate patterns in regular arrays (step and repeat). The output of the generator comprises x and y coordinate direction pulses. The organization of the instrument allows the later addition of other pattern modules. The instrument is constructed from off the shelf TTL. The advantage of the generator, compared with earlier models, is the great economy it effects with respect to the bulk of input data medium, or to the density of data, on the computer interface line.

5. SPECIFIC MEASUREMENTS

3096. An instrument for measuring in plane vibrations based on optical heterodyne

techniques (Japanese) - Ueha S., Shiota K., Tsujuchi J. et al. - Tokyo Inst. Technol., Tokyo - JACOUST.SOCJAP. 1974 30/11 (608-616)

It is shown that an optical heterodyne technique can be successfully applied for inplane vibration measurements. The design method and technical details for constructing a measuring instrument based on this technique are set out. (12 references)

3097. An electrometric method for rapid measurement of chloride concentration in small

volumes - Nunes M.A., Ogan K. and Essig A. - Dept. Physiol., Inst. Ci. Biomed., U.S.P., Sao Paulo - BIOPHYS.J. 1975 15/2II (317A)

Chloride concentrations were measured using the cell $\text{Hg}/\text{Hg}_2\text{Cl}_2/\text{KCl}$ (saturated) (salt bridge) test solution/ AgCl/Ag , and a high input impedance (10^{14} ohm) electrometer. The reference electrode was bridged to a micropipette of $15\ \mu\text{m}$ tip diameter filled with 3M NaNO_3 agar. Silver wire of $10\ \mu\text{m}$ tip diameter was shielded with epoxy cement before chloridizing. Drops of less than $1\ \mu\text{l}$ were placed on a glass silicone surface, covered with mineral oil, and probed with the aid of micropositioners. The EMF (electromotive force) of the above cell was linear with the logarithm of chloride concentration in the range of 1 mM to 4 M, with a slope of 56 mV/decade (25°C). The system showed a drift of 2 mV after 24 hr. The response time of the system was less than 100 msec.

3098. Design and characteristics of electrochemical ion sensors - AUFBAU UND

EIGENSCHAFTEN ELEKTROCHEMISCHER IONENSENSOREN - Cammann K. - Inst. Mineral. Petrographie, Univ. München - ELEKTRONIK 1975 24/3 (85-90)

Chemical analysis equipment is making increasing use of electronics, for which reason the electronic engineer must be acquainted with the fundamentals and characteristics of electrochemical ion sensors, so that he can choose these instruments correctly and handle them properly. This article is intended to fill a gap often to be found in the knowledge of an electronic engineer. Following a general definition and survey of the topic, there is treatment of the electrode processes, then the tasks and design of the reference electrodes and the correct way to handle them, and finally of the pH and ion selective electrodes, and the proper way they are to be handled, which is important if measuring errors are to be avoided.

3099. A circulation pump for liquids - Kotowski S. and Brauer H.D. - Inst. Phys. Chem., Univ. Frankfurt/M. - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (325-327)

A description is given of a gas driven circulation pump for liquids which are unstable if they contact material other than glass or a gas. The performance of the pump is independent of temperature. The maximum flow rate does not depend on the resistance of the circulation system, and can therefore be attained at all differential pressures between the entrance and exit of the pump, if the pressure of the driving gas is raised sufficiently.

3100. Novel electrical insulator for an ultrahigh vacuum line - Jones J.C. - Atomic Energy Canada Ltd, Chalk River Nucl. Labs, Chalk River, Ont. - REV.SCIINSTRUM. 1975 46/4 (489-490)

A simple and inexpensive electrical standoff insulator is described for use in ultrahigh vacuum lines. A metal gasket polyimide sandwich, used as the metal seal between standard flanges and bolts, is insulated from the flanges by polyimide sleeves and washers.

5.1. Temperature

3101. Voltage generation by laser pulses in thin films - Olivei A. - Adv. Technol. Cent. Olivetti S.p.A., Ivrea - J.PHYS.D:APPL.PHYS. 1975 8/5 (561-567)

When a surface of a thin film of molybdenum or tungsten is irradiated with 1 kW of laser power, in pulses of a few nanoseconds duration, voltage pulses of up to 0.05 V are generated in the plane of the film. This paper gives an interpretation of this effect, based on a transient thermoelectric phenomenon, and provides simple calculations of the resultant voltage pulse.

3102. Thermistor controller with microkelvin stability - Sydenham P.H. and Collins G.C. - Cooney Observatory, Dept. Geophys., Univ. New England, Armidale - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (311-315)

A DC excited thermistor bridge, and a thyristor controller were used to provide enhanced temperature stability in a 10 m long strainmeter testbase. Short term temperature variations are held within $40\ \mu\text{K}$ standard deviation. Drift over 800 h is less than $130\ \mu\text{K}/\text{h}^{-1}$, indicating that thermistor sensors can provide extreme stability in fixed set point applications. The relative bimetallic length change occurring between the steel base and the monitoring vitreous silica catenary strainmeter was maintained at a stability varying between 10^{-10} to $10^{-12}/\text{h}$, being limited by ambient influences rather than by testbase temperature changes.

3103. Lidar measurement of temperature: a new approach - Mason J.B. - Atmospheric Sci. Lab., US Army Electron. Command, White Sands Missile Range, N.M. 88002 - APPL.OPT. 1975 14/1 (76-78)

It is shown that the thermal distribution of rotational states within a molecular absorption band of a gas can be probed by means of lidar differential absorption to obtain measurements of the gas temperature. A technique for exploiting this is described, and preliminary calculations indicate that, although relatively weak absorptions are involved, sensitivities should be sufficient for profile measurements of temperature in the atmosphere.

5.4. Pressure

3104. Adapting the DISA 51F32 low pressure transducer for use in pressure scanning switches - Cook N.J. - Bldg Res. Establishm., Bldg Res. Stat., Dept. Environm., Garston, Watford - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (267-268)

A modification to the 51F32 low pressure transducer was devised to convert it into a 0.5 in internal diaphragm transducer for use in pressure scanning switches while still retaining the flush diaphragm capability. Fully dimensioned working drawings and calibrations of frequency and phase response for a range of tubing lengths are given.

5.10. Displacement

3105. Registering of ocular movements by corneal reflection. Analysis of systematic errors of the fixation position - LENREGISTREMENT DES MOUVEMENTS OCULAIRES PAR LE REFLET CORNEEN. ANALYSE DES ERREURS SYSTEMATIQUES DE LA LOCALISATION DU REGARD - Bullinger A. - Ec. Psychol. Sci. Educ., Univ. Geneve - PERCEPTION 1974 3/3 (355-360)

Errors in determining the fixation position (position of the centre of the pupil) by the corneal reflection technique are analysed. Two principal geometrical parameters are identified which allow a correction to be introduced, leading to much improved precision.

3106. A new generation of displacement

transducers - Hollis J.E.L. - Dept. Electr. Electron. Engin., Polytechn., Portsmouth - ELECTRON.ENGNG. 1975 47/565 (52-53)

A new range of displacement transducers, based on a microelectronic Hall plate was designed using standard silicon planar processing. The devices feature the inherent advantages of being small, lightweight, rugged and reliable. Built in signal processing and signal amplification capabilities result from the incorporation of silicon integrated circuitry around the sensing element.

5.11. Electric phenomena

3107. Gapped solenoid as a means of producing a highly uniform magnetic field over an extended volume - Gosling W. and Cunningham M.J. - Dept. Electr. Engin., Univ. Bath - PROC.IEE 1974 121/12 (1589-1593)

Part of the winding, near its middle, is often omitted when the volume about the centre of a solenoid, over which the magnetic field is relatively uniform, is to be extended. Field distributions are considered, and optimum gap lengths computed. The volume of specified field uniformity is compared with that of uniform solenoids. The use of solenoids with a gap makes certain precautions essential.

3108. A digitally controlled AF demagnetizer for peak fields of up to 0.1 T - De Sa A. and Widdowson J.W. - Sch. Phys., Univ. Newcastle Upon Tyne - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (302-304)

An alternating field (AF) demagnetizer capable of generating a peak field of 0.1 T at a frequency of about 300 Hz, with provision for tumbling the sample about 2 axes is described. An optoelectronic device, driven by linear and digital integrated circuitry, is used for transient free closed loop control of the field. The entire sequence of a demagnetizing cycle (the rise of the field to its exact preset peak value, and its decay to zero) is digitally controlled. The amplitude time profile of the field is well suited for the demagnetization of rock samples.

5.11.1. Electric activity

3109. Influence of the electrical properties of electrodes (Platinum wire) on the myoelectric signal - INFLUENCE DES PROPRIETES ELECTRIQUES DES ELECTRODES FILS DE PLATINE SUR LE SIGNAL MYOÉLECTRIQUE - Metral S., Maton B. and Gougerot L. - Lab. Biophys., UER Broussais, Paris - ELECTROENCEPH.CLIN.NEUROPHYSIOL. 1975 38/3 (321-324)

The use, in electromyography, of platinum wire electrodes requires a knowledge of the electrical characteristics of these electrodes in the frequency range of the myoelectric signal. For this purpose, the impedance of these electrodes was measured by the ' cercle pointe' method (Gougerot 1951) under conditions similar to those in use. These electrodes behave like the majority of metal electrodes. Their impedance, in particular, can be represented by a polarization capacity shunted by an ohmic resistance, in series with a resistance representing the electrolyte resistance. It is shown that, depending on the electrode area and the way they are used, these electrodes can detect the myoelectric signals more or less selectively.

5.11.2. Impedance

3110. A computer based, four terminal impedance measuring system for low frequencies - Bell D.J., Coster H.G.L. and Smith J.R. - Sch. Phys., Univ. New South Wales, Sydney - J.PHYS.E: SCIENT.INSTRUM. 1975 8/1 (66-70)

A 4 terminal high precision measuring system is described for the determination of capacitance, C, and conductance, G, at very low frequencies (0.1 - 1000 Hz). The method, which offers both speed (close to the theoretical upper limit) and accuracy (phase $\pm 0.01^\circ$, impedance amplitude $\pm 0.1\%$) was specifically designed for the investigation of the dispersion of C and G in the plasma membrane of living cells. The system, with minor modifications should, however, also find application elsewhere. The system described was designed around a small computer which is used via analogue digital and digital analogue converters and digital interfaces to both control and measure the frequency and amplitude of the AC signals and to measure the AC potential appearing across the impedance under test. After the data for a complete set of programmed frequencies has been collected the analysis of the data points for current and voltage, which may be accumulated in memory over a specific number of cycles, yields the relative phase and amplitude of the current and voltage and hence C and G.

3111. In vivo measurement of electrical impedance of cryosurgical tissue injuries - IN VIVO UNTERSUCHUNGEN DER ELEKTRISCHEN IMPEDANZ KRYOCHIRURGISCHER GEWEBSLASIONEN - Pliquet F. and Steinert R. - Inst. Biophys., Karl Marx Univ., Leipzig - ZEXP.CHR. 1974 7/6 (376-381)

The changes in muscle tissue after cryosurgical treatment were analyzed in passive electric experiments on animals *in vivo*. A reduction of the average relaxation time and a

decrease in the interaction constant of substructures were observed. It is shown that by measurement of impedance difference, a parameter can be determined that yields sufficient information on the state of the tissue. By this method, the effect of cryosurgical treatment can be evaluated without loss of time and without unpleasant operative procedures.

5.14. Radiation

3112. Research on biological effects of VLF band electromagnetic radiation - Bollinger J.N., Lawson R.L. and Doile W.C. - Southwest Res. Inst., San Antonio, Tex. 78284 - AEROMED.REV. 1974 SAM-TR-74-52 (131p)

This investigation was undertaken to determine whether exposure of mice to very high field intensities of very low frequency (VLF) electromagnetic radiation will produce nonthermal detrimental biological effects. Two fields intensities were employed at a frequency of 25 kHz; $E = 15,000$ V/m and $H = 7.5$ A/m for full power exposures, and $E = 10,600$ V/m, $H = 5.3$ A/m for one half power exposures. The 15,000 V/m electric field and the 7.5 A/m magnetic fields were equal to a power $59,500$ mW/cm² and $2,120$ mW/cm² or 5,950 and 212 times greater, respectively, than the 10 mW/cm² current US standard. Growth, reproduction, metabolism, and pathological studies of VLF effects were conducted on C3H/He mice exposed to both the one half power and full power fields. Exposure consisted of 1 hr per day, 5 days a week, for a total of 50 hr for the growth, reproduction, and metabolism studies. An additional group of animals was exposed 10/100 hr for the assessment of possible pathological changes associated with these fields. The results indicated that the high intensity low frequency electromagnetic radiation exposure of dams and neonates had no statistical detectable effect on the growth, reproductive ability, and metabolism of the neonates or the growth of their subsequent offspring. Hematology evaluations (Ht, Hb, RBC, and CBC's), major organ weights, and histopathological examinations of the major organs (including the inner ear and the eye) also revealed no detectable VLF exposure effects. No incidence of C3H/He mouse mammary tumor development was noted up to 98 days of age. Cytological analysis revealed no obvious VLF effects on the number or architecture of the bone marrow chromosomes. H^3 -thymidine uptake studies of lymphocyte cultures prepared from VLF exposed mice strongly indicated that the VLF electromagnetic radiation stimulated the uptake of thymidine. It is unknown whether this finding is related to an increased immune response, but screening for major parasites revealed no differences in the incidence among the groups. Consequently, it could not be ascertained from this investigation whether this finding was detrimental or beneficial to the immunological system. The final conclusion drawn from this investigation is that the exposure of mice to high intensity low frequency electromagnetic radiation produced no obvious

detrimental biological effects, but may have had a subtle influence on their immune system.

3113. A study of the low energy background of a phoswich detector - Johnson J.R. - Radiol. Safety Div., AEE, Winfrith/Dorchester - HLTH PHYS. 1975 28/4 (466-468)

Phoswich detectors are becoming widely used to monitor human subjects for possible internal radioactive contamination. They are used as monitors for isotopes such as ^{239}Pu (in lung) and ^{210}Pb , for which the only radiation capable of penetrating to the outside of the body with any measurable intensity are low energy photons. This study has revealed 2 sources of low energy background not normally considered when phoswich detector backgrounds are being optimized. The first of these, the delayed emission from the photomultiplier tube, will not effect the background in the plutonium energy band but would be important if lower energy photons were being measured. The second, the background due to the photomultiplier tube itself, does increase the background in the plutonium band by approximately a factor of 2.

5.14.1. Visible light

3114. The correction of tubelength to compensate for coverglass thickness variations - White G.W. - 10 Westhall Rd, Kew Gardens, Richmond - MICROSCOPY (London) 1974 32/10 (411-420)

The effects of coverglass thickness variations on spherical aberration in the optical system of the microscope are summarized. Approximate formulae for the amount of tubelength correction needed to minimize these effects are considered, and graphical solutions are investigated. Correction tables are given, and experimental procedures are described for tubelength correction in visual microscopy and photomicrography.

3115. Improvements in the use of filter colorimeters - Wharmby D.O. - Thorn Lighting Ltd, Leicester - J.PHYS.E: SCIENT.INSTRUM. 1975 8/1 (41-44)

Measurements have been made of the spectral response of the filter cell combinations of a commercial colorimeter. Regression analysis was used to determine which linear combination of filters and cells gives the best least squares fit to the CIE color matching functions. Calculations and measurements show that good accuracy is attainable even in the measurement of the chromaticities of discharge lamps. The method, which is a mathematical analogue of the Dresler (1933) filter principle, can be applied to improving the accuracy of existing colorimeters and to the design of high accuracy filter colorimeters, photometers and filter radiometers.

3116. Estimation of descriptive parameters of overlapping chromatographic peaks: a simulation study - Phyo I., Ackerman E., Gatewood L.C. and Rosevear J.W. - Meharry Med. Coll., Nashville, Tenn. 37208 - MATHEBIOSCI. 1974 22 (95-112)

The characteristics of a non linear optimization technique for resolution of

overlapping chromatographic peaks are examined. A modified Meiron Marquardt method was used. The estimates of the parameters of overlapping peaks in simulated chromatograms were investigated to indicate the limitations of present mathematical methods and hopefully, to improve their ultimate utility. Gaussian shapes as well as exponential Gaussian convolutes were used to simulate the chromatographic peaks. Effects on the overall performance of varying relative heights, widths, and separation of 2 peaks were determined. Random additive noise and base line drift were also simulated. For illustrative purposes, the performance of the parameter estimation techniques was expressed in terms of relative errors in estimating the second (or smaller) peak's area, height and location. The results presented indicate the relative importance of noise, skewness, height and width ratios and peak separation on the maximum resolution achievable by numerical methods in an automated chromatographic system.

3117. Temporal response and real time measurements with a 5 GHz photocell oscilloscope system at low light levels - Sipp B., Miche J.A. and Clement G. - Lab. Phys. Rayonnem. Electron. Nucl. Cent. Rech. Nucl. Strasbourg - J.PHYS. SCIENT. INSTRUM. 1975 8/4 (296-298)

Experiments were carried out to investigate, by means of picosecond mode locked laser pulses, the performance of the fast vacuum photoelectric cells associated with a high sensitivity, high speed cathode ray tube provided with a channel plate electron multiplier. An overall time response of less than 100 ps was measured with an amplitude sensitivity of 140 mV/cm⁻¹.

3118. Flashlight size external cavity semiconductor laser with narrow linewidth tunable output - Heckscher H. and Rossi J.A. - Lincoln Lab., MIT, Lexington, Mass. 02173 - APPLOPT. 1975 14/1 (94-96)

The construction of a compact and relatively inexpensive external cavity to be used with III-V compound semiconductor injection lasers is described. The operation of a typical GaAs diode in the cavity and some of the limiting performance factors are discussed.

3119. Transient thermal blooming of long laser pulses - Buser R.G. and Rohde R.S. - US Army Electron. Command, Fort Monmouth, NJ. 07703 - APPLOPT. 1975 14/1 (50-55)

Existing theory for stationary laser pulse propagation in absorbing media for times greater than the acoustic transit time is compared with experiments. Collimated and focused Gaussian beams as well as unstable resonator type beams are investigated. Good agreement is reached for all experimental conditions for collimated beams, and at higher energy deposition significant deviations are observed for focused beams.

3120. Laser isotope separation using two photon selective excitation; its quantum efficiency and separation factor - Liu Y.S. - Gen. Electr. Corp. Res. Developm. Cent., Schenectady, N.Y. 12301 - APPLOPT. 1975 13/11 (2505-2511)

Application of 2 photon selective excitation to isotope separation with high power, high resolution tunable lasers is discussed. A simple kinetic model is given to determine quantum efficiency and separation factor in terms of laser powers and relaxation constants. A numerical example is used to demonstrate the feasibility of the scheme. Results indicate that a high quantum yield is obtainable with the optical technique.

3121. Scan line filters for optical spectral analysis - Baker B.R. - Ampex Corp., Redwood City, Calif. 94306 - APPLOPT. 1975 14/2 (353-362)

A class of filters is studied for applications in optical spectrum analyzers. The output device of the analyzer is a masked vidicon. Consequently the design criteria differ from those for filters commonly used in digital data processing, radar antenna shading, and conventional apodization. It is shown that crosstalk or interlocus interference can be reduced for practical geometries to a level about 20-30 dB lower than that of an unshaded aperture.

3122. Method of an effective nonrigid rotor in the theory of molecular vibrational rotational spectra - Makushkin Yu.S. - OPT.SPECTROSC. 1974 37/4 (376-378)

Use of the method of an effective nonrigid rotor in the theory of molecular vibrational rotational spectra is validated. The Hamiltonian for an effective nonrigid rotor is constructed. It is shown that use of this method permits substantial simplification of the vibrational rotational function of molecules.

3123. Depolarization of fluorescence during decay, using multichannel time analysis - Volodko L.V., Demchuk M.I., Kozlov I.N. et al. - OPT.SPECTROSC. 1974 37/4 (392-394)

An apparatus is described which records variation of the degree of polarization of fluorescence during decay, with high accuracy. The preliminary results obtained on some problems of the theory of rotational depolarization of the fluorescence of 2 acetyl anthracene dissolved in glycerine and on the theory of concentrational depolarization of fluorescence in the case of sodium fluorescein solutions in polyvinyl alcohol films are discussed.

5.14.2. Ultraviolet

3124. Some applications of GM counters in the vacuum ultraviolet spectral region - Ederer D.L. and Dhez P. - Nat. Bur. Stand., Washington, D.C. 20234 - REV.SCLINSTRUM. 1975 46/2 (144-146)

The applicability of GM and proportional counters naturally extends into the vacuum ultraviolet spectral region. A simple modification to this detector enables GM counters to be used to measure very small section variations or to be used as high efficiency detectors over a narrow spectral range with excellent second order discrimination.

3125. Narrowband ultraviolet vapor filter - Senitzky B. - Polytechn. Inst. New York,

A narrowband optical vapor filter based on the principle of selective specular reflection from vapors is described. The device consists of a mercury vapor cell with Brewster angle windows that selectively reflects the 2537 line and transmits other radiation. The bandwidth of the device varies from 0.1 to 1.0 Å as a function of the mercury vapor pressure. Its signal to skirt rejection ratio at an acceptance angle of 7° is 28 dB, and its acceptance area is 1 cm². It is used to perform a spectrochemical analysis of mercury in water, and also to take a monochromatic photograph of the spatial distribution of excited mercury atoms in a flame.

5.14.3. Infrared

3126. The use of tellurium as an infrared filter - Gertovich T.S., Grineva S.I., Dvorkina V.Ya. et al. - SOVJ.OPT.TECHNOL. 1974 41/4 (232-233)

Various filters are used to separate certain regions of the infrared spectrum in which infrared devices and systems operate. The authors show that, in particular, tellurium can be used as a filter, and possesses a number of advantages.

3127. Tilt tunable ultra narrow band filters for high resolution infrared photometry - Roche A.E. and Title A.M. - Lockheed Palo Alto Res. Lab., Palo Alto, Calif. 94304 - APPLOPT. 1975 14/3 (765-770)

The design and operating characteristics of several recently fabricated solid spaced Fabry Perot interference filters having bandwidths from 0.3 Å to 8 Å in the 1-5 μm ir wavelength range are discussed. The 10⁴ achievable resolving power of these devices, particularly at the higher wavelengths, represents several orders of magnitude improvement over conventional ir filters, and the implications of this very high resolution along with the tilt tuning properties of narrow band filters are discussed in relation to atmospheric remote sensing.

5.14.4. Radiowaves

3128. Application of fluid crystals for the detection of microwave fields (Polish) - Kierski J. - Inst. Med. Pracy, Lodz - PROBL.TECHN.MED. 1975 6/1 (57-64)

The use of fluid crystals to detect microwave fields is described. The working principle of a fluid crystal microwave detector is based on the demonstration of a rise in substructural surface temperature due to microwave absorption. In experimental models the detectors were found to be adequate if the stream density power was within the range of 65 mW/cm² with a wave length of about 10 cm. The value of fluid crystals in medicine to measure the body surface temperature is confirmed.

3129. A pyroelectric probe for measurement of microwave power density under far field

conditions - Huddleston G.K. and McRee D.I. - Sch. Electr. Engin., Georgia Inst. Technol., Atlanta, Ga. 30332 - ANN.N.Y.ACAD.SCI. 1975 vol. 247 (510-526)

It is worthwhile to review the particular merits and demerits of pyroelectric probes for microwave dosimetry applications. First, the pyroelectric probe is a dielectric rather than conducting structure; however, conducting elements are required for instrumentation (e.g., electrodes and signal paths). The pyroelectric crystal is a high impedance device that requires an impedance transformer (preamplifier) to facilitate instrumentation. The requirement for locating the preamplifier close to the crystal element poses some problems from an electromagnetic point of view; however, further reductions in the physical size of the preamplifier unit are well within the state of the art of solidstate devices. Although the pyroelectric detector is a thermal detector, it responds to the time rate of temperature change and not the temperature itself; hence, modulation of the radiation is required. Even though the modulation requirement represents a disadvantage for field survey applications, it is advantageous in the laboratory, because it provides a means of discriminating against unwanted signals. The response of the pyroelectric detector depends on its thermal properties and on those of the surrounding media, and attention must be paid to the thermal aspects in probe design. Lossy materials may be applied to the crystal to enhance the bandwidth of a pyroelectric probe but only at the expense of maximum responsivity at some optimum frequency. Finally, the pyroelectric detector is not susceptible to burnout due to high values of microwave power density; if the Curie temperature is exceeded, the detector may be revitalized merely by repoling the crystal. The feasibility of pyroelectric probes for use in the measurement of microwave power density under far field conditions throughout the 2.0 to 12.0 GHz frequency band has been established. Additional work is required to fully develop the potential of such probes. Future work should include the development of an implantable pyroelectric probe for measurements of volumetric power density inside of biologic materials.

3130. Microwave dielectric measurements using time domain spectroscopy: note on recent technique advances - Suggett A. - Basic Stud. Unit, Unilever Res. Colworth/Welwyn, Sharnbrook, Bedford - J.PHYS.E.SCIENT.INSTRUM. 1975 8/4 (327-330)

Use of the techniques of time domain spectroscopy (TDS) to determine the microwave properties of materials is a rapidly developing field. Two recent advances in techniques are described. First, a method for reducing the uncertainty with which the time domain waveform can be referred to a common time origin which permits time referencing to better than 0.08 ps (more than an order of magnitude improvement on the use of more conventional time markers) and requires only the basic TDS instrumentation, and second, a variation in TDS technique involving the use of a high pass filter. By eliminating the effects of 'low frequency noise', a better defined pulse shape for Fourier transformation is produced, thus reducing

truncation errors.

5.14.5. Roentgen radiation

3131. High voltage selenium rectifiers in radiography - SELEN HOCHSPANNUNGSGLEICHRICHTER IN DER RONTGENTECHNIK - Westphal H. - Sitz Nurnberg, ITT Bauelem. Gruppe Europa, Nurnberg - MED.TECHN. (Stuttg.) 1975 95/2 (34-36)

The selenium rectifier is still a popular choice for many applications, despite the rapid development of the single crystal rectifier. Even today due to its technical advantages it cannot be replaced in numerous applications. An interesting application is in providing DC power for X ray units. Voltages up to 150 kV are required for X ray units. In these units the currents appear for short periods (msec) and reach a maximum of approx. 1250 mA. In the application described (an X ray unit with automatic organ selection) the advantages of the selenium rectifier are exploited to the full. The series connection of the rectifier, necessitated by the high voltage, can be achieved without problems. An expensive protection circuit is not necessary due to the ability of the selenium rectifier to withstand high surge currents. The ability of the selenium rectifier to withstand heavy overloads results in a high degree of safety.

3132. A new development in quantitative X ray analysis - Editorial - LAB.EQUIPM.DIG. 1974 12/10 (61-62)

The TEFA 6110 (tube excited analysis) system is a new development from ORTEC, for high speed quantitative elemental analysis of solid, liquid and powdered sample materials, covering the range of sodium through to uranium. Special attention was paid to the operational simplicity.

3133. X ray emissions from colour television receivers in New Zealand - Luketina I.A. - Nat. Radiat. Lab., Dept. Hlth., Christchurch - NZ.MED.J. 1975 81/534 (197-200)

Colour television receivers produced for the New Zealand market have been tested to ensure that any x radiation emissions result in dose rates less than the 0.5mrem/h (500 μ rem/h) limit allowed under the Radiation Protection Regulations, 1973. Five receivers representing the 5 different models available on the New Zealand market were surveyed and the maximum dose rate measured from any screen was 0.05 μ rem/h. The estimated maximum annual radiation dose to an average viewer from the receivers surveyed will be less than 5 μ rem or less than 5×10^{-3} percent of the dose from natural background radiation. This level of x radiation is well below that which could constitute a health hazard.

5.14.6. α , β and γ radiation

3134. A calorimetric radiation dosimeter for an accelerator environment - Lambert K.P., Van De Voorde M., Doke T. and Inada T. - ISR Div.,

CERN, Geneva - NUCL.INSTRUM.METH. 1974 120/3 (501-508)

The main concepts of absorbed radiation dose calorimetry are discussed, and a description is given of a calorimeter capable of measuring absorbed doses from 2.0×10^{-2} to 2.0×10^5 Rad in an accelerator radiation environment.

3135. Relative efficiency calibration of a Si(Li) electron spectrometer - Jardine L.J. and Lederer C.M. - Lawrence Berkeley Lab., Univ. California, Calif. 94720 - NUCL.INSTRUM.METH. 1974 120/3 (515-520)

A method for determination of the relative efficiency of Si(Li) electron spectrometers with the sources 180 mHf, 207 Bi, and 210 At is described. New measurements of some relative γ ray (photon) intensities in 180 mHf and 207 Bi are given. Electron line intensities for all three sources, calculated from the decay schemes, γ ray intensities, and theoretical internal conversion coefficients, are tabulated.

3136. Muon shielding around high energy electron accelerators. Part II. Experimental investigation - Nelson W.R., Kase K.R. and Svensson G.K. - Stanford Linear Accelerator Cent., Stanford Univ., Stanford, Calif. 94305 - NUCL.INSTRUM.METH. 1974 120/3 (413-429)

The results are presented of an experiment measuring the fluence and absorbed dose delivered by electron accelerator produced muons penetrating thick iron shields. The experiment was designed to check the theoretical calculations described in a previous paper. Nuclear track emulsions and scintillation counters were used to measure fluence, and LiF was used for the dose measurements. It is shown that the absorbed dose can be calculated from the fluence data by using a restricted stopping power. The results of the measurements indicate that the theoretical calculation accurately predicts the muon fluence and absorbed dose at small angles (<30 mrad) but underestimates both at large angles by one order of magnitude or more. Several possible explanations for this effect are discussed.

3137. Component resolution indices for scintillation camera systems - Brookeman V.A. - Univ. Florida Coll. Med., Gainesville, Fla. 32610 - J.NUCL.MED. 1975 16/3 (228-230)

From published overall resolution indices for three Anger camera systems, measured with three straight bore collimators and $^{99}\text{TC}(\text{m})$ in air and with a water absorber present, the components due to inherent camera resolution, collimator geometry, and scatter are derived at various depths. Replacement of S-11 multiplier phototubes by bialkali phototubes improves calculated inherent Pho/Gamma III camera resolution by about 30% and by a further 33% upgrading to a high performance model. At distances 2, 5, 8 and 10 cm from each collimator face with an intervening water absorber, mean scatter components of overall resolution indices are 6, 8, 9, and 10 mm, respectively. In typical clinical $^{99}\text{TC}(\text{m})$ imaging situations with a scattering medium present, the relative contributions of the camera, collimator, and scatter to the total overall system resolution are presented.

3138. A gamma ray densitometer for the investigation of pulmonary function - Evans A.L., Kennedy J., Davison M. et al. - Dept. Clin. Phys. Bio Engin., West Scotland Hlth Boards, Glasgow - PHYS.MED.BIOL. 1975 20/2 (261-267)

The design, construction and performance of a gamma ray densitometer are described. The instrument, which is used in the investigation of regional pulmonary function, has both digital and analogue outputs.

3139. Cerebral radiation surgery with narrow gamma beams: physical experiments - Sarby B. - Dept. Phys. Biol., Gustaf Werner Inst., Univ. Uppsala - ACTA RADIOL.SERT.PB (Stockh.) 1974 13/5 (425-445)

The physical and geometrical demands on the single beam channel for the precise irradiation of small intracranial structures with ^{60}Co gamma radiation were evaluated. Model experiments, performed with the aid of photographic dosimetry on various types of collimating systems, in combination with theoretical calculations on an idealized beam geometry showed the possibility of shaping well collimated gamma beams with a sufficiently high energy fluence rate. Unwanted contributions to the dose in regions outside the geometrical edges of the primary beams due to scattering and transmission effects were analysed.

3140. A method for stabilizing the efficiency of copper walled CO_2 filled proportional counters - Alessio M., Bella F. and Improta S. - Ist. Fis., Univ. Roma - NUCLINSTRUM.METH. 1975 124/2 (597-599)

The maximum age measurable with the ^{14}C method can be increased by lengthening the counting time, if the count fluctuations are kept within the limits of statistical errors. In copper walled, CO_2 filled counters, a systematic decrease in counting rate was observed, due to the formation of impurities, which does not allow for a suitable lengthening of the counting time. An apparatus is described consisting of a counter through which the filling gas, continuously purified, is made to flow slowly during the measurement. This makes it possible to extend the duration of the measurements with copper walled CO_2 filled counters.

3141. Theoretical considerations for standardization of ^{125}I by the coincidence method - Horrocks D.L. and Klein P.R. - Sci. Instrum. Div., Beckman Instrum. Inc., Irvine, Calif. 92644 - NUCLINSTRUM.METH. 1975 124/2 (585-589)

The decay scheme of ^{125}I is analyzed. The probabilities of emission are calculated for each of the several pathways of ^{125}I decay. The equation for calculation of the source decay rate by the coincidence method is derived from these probabilities.

3142. Resolution improvement in CdTe gamma detectors using pulse shape discrimination - Jones L.T. and Woollam P.B. - Cent. Electricity Generating Board, Berkeley Nucl. Lab., Berkeley - NUCLINSTRUM.METH. 1975 124/2 (591-595)

Pulse shape discrimination was used to improve significantly the resolution of CdTe

gamma detectors. By selecting those pulses with rise times less than 100 ns, the full width at half maximum (fwhm) resolution at 661 keV may be reduced to 14 keV at room temperatures, and 8 keV at 0°C. The resulting peaks have a full width at tenth maximum (fwtm) less than twice the fwhm, and may be readily identified and integrated using standard spectrum analysis techniques.

5.14.7. Neutrons

3143. A new method for monitoring the threshold of a large neutron scintillation counter - Christ A., Noelleke G., Nuding W. and Reichelt T. - Phys. Inst., Univ. Bonn - NUCLINSTRUM.METH. 1974 120/3 (527-528)

The dependence of the β counting rate of a ^{90}Sr source on the discriminator threshold of a large neutron counter was used to continuously monitor the stability of the threshold during experiments.

5.14.8. Cosmic radiation

3144. Two high resolution velocity vector analyzers for cosmic dust particles - Auer S. - Lab. Optical Astronomy, Goddard Space Flight Cent., Greenbelt, Md. 20771 - REV.SCLINSTRUM. 1975 46/2 (127-135)

Two new methods are described to measure velocities and angles of incidence of charged cosmic dust particles with precisions of about 1% and 1°, respectively. Both methods employ four one dimensional position sensitive detectors in series. The first method utilizes a charge dividing technique while the second utilizes a time of flight technique for determining the position of a particle inside the instrument. The velocity vectors are measured although mechanical interaction between the particle and the instrument is completely avoided. Applications to cosmic dust composition and collection experiments are discussed. The range of radii of measurable particles is from about 0.01 to 100 μ at velocities from 1 to 80 km/sec.

3145. The effects of cosmic particle radiation on pocket mice aboard Apollo XVII: III. Dosimeter design, construction, and implantation - Winter D.L., Suri K., D'Urso J.A. et al. - NASA Ames Res. Cent., Moffett Field, Calif. 94035 - AVIAT. SPACE ENVIRON.MED. 1975 46/4II (494-499)

To detect the passage of cosmic ray particles through the heads of the pocket mice during the Apollo XVII flight, a 'monitor' (dosimeter) composed of plastics was prepared and implanted under the scalp. The monitor was mounted on a platform, the undersurface of which fitted the contour of the skull. Numerous tests were run to assure that the presence of the monitor assembly beneath the scalp would be compatible with the well being of the mice and that the capacity of the monitor to detect the traversal of cosmic ray particles would be preserved over the several wk during which it

would remain under the scalp.

3146. The effects of cosmic particle radiation on pocket mice aboard Apollo XVII: VI. Launch, flight, and recovery - Look B.C., Tremor J.W., Barrows W.F. et al. - NASA Ames Res. Cent., Moffett Field, Calif. 94035 - AVIAT. SPACE ENVIRON.MED. 1975 46/4II (529-536)

An experiment involving flying 5 pocket mice in the Apollo XVII command module was carried out at the NASA (North American Aeronautics and Space Administration) Kennedy Space Center. Upon completion of the 13 day space flight, the package was removed from the spacecraft and, after having been purged with an oxygen helium gas mixture, was flown to American Samoa. Four of the 5 mice were recovered alive from the package. Analysis of the mouse that died during the flight revealed several factors that could have been contributed to its death, the chief of which was massive hemorrhage in its middle ear cavities.

5.14.9. Sound

3147. Atmospheric infrasound radiated by bridges

- Donn W.L., Balachandran N.K. and Kaschak G. - Lamont Doherty Geol. Observat. Columbia Univ., Palisades, N.Y. 10964 - JACOUST.SOCAMER. 1974 56/5 (1367-1370)

Constant frequency infrasound (about 5 to 10 Hz for different sources) has been detected at a number of locations from different directions. In an intensive study of 8.5 Hz infrasound, positive sound fixes have been obtained at the Tappan Zee bridge. Geophones placed at several locations on the bridge recorded vibrations of the same frequency. It is concluded that the vibrational motions of bridges radiate infrasound into the atmosphere and that the infrasound is most readily detected during times when atmospheric wind and temperature structure favor acoustic channelling near the ground. The acoustic signal occurs in pulses having a duration which, although fairly constant on a given occurrence, may vary from a fraction of a min to several min.

3148. Chemistry of ultrasound. III. The irradiative behavior of simple aliphatic amines - Fayter R.G. Jr. and Spurlock L.A. - Metcalf Res. Lab., Brown Univ., Providence, R.I. 02912 - JACOUST.SOCAMER. 1974 56/5 (1461-1468)

The ultrasonic irradiation of water was effected under an argon atmosphere with an 800 kHz transducer at several intensities. The rates of hydrogen peroxide formation were followed by spectrophotometric analyses. The results were utilized to relate intensity to reaction rate for standardization purposes. Irradiations of several alkyl amines in aqueous solution or suspension were next accomplished under conditions similar to those applied to pure water. Products included aldehydes, an alcohol, amines, an N oxide, methane, ethane, ethylene, carbon monoxide, and hydrogen. The products and their ratios were dependent on the structure of the amine used in the reaction. Reaction rates were only slightly

different when an oxygen atmosphere was used instead of argon. The reactivity order for the amines was observed to be primary > secondary > tertiary. Methylamines reacted somewhat faster than did n butylamine.

3149. Immersion apparatus for ultrasonic measurements in polymers - Hartmann B. and Jarzynski J. - Nav. Ordnance Lab., Silver Spring, Md. 20910 - JACOUST.SOCAMER. 1974 56/5 (1469-1477)

An immersion apparatus for making ultrasonic measurements in polymers was constructed. A unique feature of this apparatus is that the specimen is held vertically, and the transducers are rotated in order to produce shear waves in the specimen. This arrangement allows measurements to be made through the melting point of crystalline polymers. Sound speed measurements, accurate to $\pm 2\%$, were made on 25 polymers at room temperature and on 5 of these polymers as a function of temperature. On 15 of the polymers, both longitudinal and shear sound speeds were measured. The longitudinal wave speeds ranged from 2820 to 1020 m/sec, while shear wave speeds ranged from 1230 to 650 m/sec. Using these sound speeds and measured densities, the elastic constants of these polymers were calculated. For 4 polymers elastic constants as a function of temperature were calculated.

3150. Rectified diffusion in the presence of, and absence of, acoustic streaming - Gould R.K. - Middlebury Coll., Middlebury, Vt. 05753 - JACOUST.SOCAMER. 1974 56/6 (1740-1746)

Individual air bubbles held in the central interior of a water filled chamber by a 20 kHz pressure gradient force, were observed dissolving in undersaturated water and growing by rectified diffusion in saturated water. When bubbles grew or dissolved in the absence of nearby acoustic streaming, present theories for normal diffusion and for rectified diffusion in the absence of streaming gave reasonable agreement with experiment. When crisspations appeared on a bubble, acoustic streaming accompanied the surface activity and the rate of dissolution or growth of the bubble was intensified up to twentyfold. Measurements of threshold sonic pressures for onset of crisspation revealed that, in general, the larger the bubble the lower the pressure required. Present theories for diffusion in the presence of acoustic streaming imply, in contrast to experiment, that streaming should inhibit rectified diffusion in saturated and undersaturated liquids. For gas bubbles dissolving in undersaturated liquids, the effects of sound on mass transfer can be made negligible, and experimental measurements of the diffusion coefficient of the gas in the liquid can be obtained.

3151. Analysis of the wave motion in a coupler for the pressure calibration of laboratory standard microphones (Japanese) - Miura H. and Matsui E. - Fac. Engin., Shizuoka Univ., Shizuoka - JACOUST.SOCJAP. 1974 30/12 (639-646)

A theoretical study is made of the corrections for coupler calibration of laboratory standard microphones. In the analysis, the effect of wave motion in a coupler is discussed, taking

into consideration the interaction between the microphone diaphragm and the medium. A new method of solving the wave equations, called the infinite matrix method, is presented. A coupler is divided into several right circular cylinders and 2 diaphragms. Each part can easily be solved in general form as an expansion into orthogonal functions. After arranging these solutions in the form of matrix equations with unknown variables, one obtains a system of simultaneous matrix equations by connecting the solutions together. Exact solutions of the wave motion correction as well as the transmission characteristics for both type 20 cc and 3 cc couplers are presented. It is also confirmed that the numerical results for the case of the transmission characteristics of the 20 cc coupler are rapidly convergent.

3152. Ultrasonic Doppler velocimetry. Signal and radar theory - VELOCIMETRIE ULTRASONORE DOPPLER. LA THEORIE DU SIGNAL ET SON APPLICATION AU RADAR - Carpentier M.H. - Branche Equipem., 23, Rue de Courcelles, Paris - COLLINEUR, PARIS 1974 Vol. 34 (31-67)

The theoretical problems presented by the study of ultrasonic systems are the same as those posed by radars. In the first part, this article develops the mathematical concepts useful for the elaboration of a radar theory. In particular, the Fourier transform is described, with its main properties and its theorems of application (Wiener Kintchine, Parseval), and the gaussian noise with its statistical properties is discussed. In the second part, equations specific to radars, the solutions found to the problem of reception, and the theoretical limitations (ambiguity, precision of the measurement of distance and velocity) are stated.

3153. Ultrasonic irradiation and pupillary response - Greguss P. - Dept. Ophthalmol., New York Med. Coll., New York, N.Y. - ULTRASONICS 1975 13/2 (63-65)

The effect of ultrasonic irradiation on the pupillary response was investigated over an intensity range from 0.1 to 1.5 W cm⁻² measured at the surface of the applicator head at frequencies of 0.8 and 2.4 MHz.

3154. Computer analysis of bowel sounds - Dalle D., Devroede G., Thibault R. and Perrault J. - Dept. Chir., CHU, Sherbrooke - COMPUT.BIOL.MED. 1975 4/3-4 (247-256)

An automatic method of analysis of bowel sound recordings has been developed. A PDP8/I computer, equipped with DECtape and interfaced with a TR48 analog computer was used for the analysis. It was found that the probability of a sound occurring followed a law similar to that of Poisson's phenomenon. Mean energy sound duration and silence duration in the postmeal situation were respectively, 0.1589 V RMS, 4.5 msec, and 31.7 msec. No frequency exceeded 300 Hz. This method of analysis was applied to experimental situations to study the importance of various parameters influencing the genesis of bowel sounds.

3155. Needle aspiration and B mode scanning - Becker J.A., Schneider M., Staiano S. and Cromb

E. - Dept. Radiol., State Univ. New York, Downstate Med. Cent., Brooklyn, N.Y. 11203 - INVESTRADIO 1975 10/2 (173-175)

B Mode scanning for the identification of the nature of renal masses is considered an excellent method for the determination of the benign or malignant nature of the renal mass after an abnormal urogram. In further confirmation with this technique, percutaneous aspiration utilizing an aspirating transducer and B Mode scanning produced a reliable method of obtaining fluid and injecting the cyst, if so desired.

3156. Absorption and dispersion of ultrasound in biological tissue - Wells P.N.T. - Bristol Gen. Hosp., Bristol - ULTRASOUND MED.BIOL. 1975 1/4 (369-376)

Absorption of ultrasound is the process of conversion of vibrational energy into heat. In biological soft tissues, the absorption coefficients are roughly proportional to the frequency; typically $a = 1 \text{ dB cm}^{-1} \text{ MHz}^{-1}$. The velocities in soft tissues are similar, being about 1,500 msec⁻¹. Classical viscosity theory cannot explain this form of absorption. A relaxation process is associated with a range of frequency over which there is dispersion in velocity (from a low value at low frequencies to a high value at high frequencies) and a maximum in the absorption per wavelength. Experimental data, particularly for hemoglobin solutions, indicate that absorption and dispersion in biological materials are due to relaxation processes distributed over a range of frequencies. The dispersion is small, and usually negligible in relation to variations and uncertainties of measurement. The natures of the relaxation processes which are involved have yet to be resolved; possibilities include solvent-solute interactions and disturbances in H bonding equilibria. Lung has a lower velocity than that of solid tissues, whereas that of bone is higher; both have higher values of absorption.

3157. Ultrasonic pulse spectroscopy of a solid inclusion in an elastic solid - Bifulco F. and Sachse W. - Dept. Theoret. Appl. Mech., Cornell Univ., Ithaca, N.Y. 14850 - ULTRASONICS 1975 13/3 (113-116)

Experiments were conducted to measure the arrival time and the power density spectra of wide band ultrasonic pulses as scattered by a circular, cylindrical, solid inclusion in a matrix of aluminium. Cavities of 3.18 and 6.35 mm diameter were alternately filled with 4 different solids possessing a wide range of acoustic properties. Results show that the time history and the spectral analysis of the scattered pulses can be used to determine the size of the cavity or the wave velocity in the solid inclusion.

3158. The importance of sound absorption on air at low ultrasonic frequencies for architectural acoustic models - Hamilton W.N. and Langton N.H. - Robert Gordon's Inst. Technol., Aberdeen - ULTRASONICS 1975 13/3 (132-137)

A review of the absorption mechanism of sound in air is given in simple terms and is followed by a brief report on the level to which architectural acoustic models require to be dried

in order to match the air absorption in their full sized counterpart. The level must necessarily be a compromise depending on the ultrasonic range of frequencies used in the model and is further complicated by the lack of absorption data available at very low percentage values of relative humidity.

3159. Effects of flanking and test environment on lab field correlations of airborne sound

insulation - Jones R.E. - Forest Prod. Lab., Forest Serv., US Dept. Agric., Madison, Wis. 53705 - JACOUST.SOCAMER. 1975 57/5 (1138-1149)

Previous attempts to correlate lab and field sound insulation performance have been based on a comparison of the lab sound transmission class (STC) and the field sound transmission class (FSTC). In this study comparisons of the 1/3 octave bandwidth transmission loss (TL) values are made taking into account partition transmission, flanking transmission, and test environment factors. An experimentally determined flanking TL is obtained through a quantitative relationship between the partition, flanking, and field TL. This determination allows separation of test environment factors related to diffuseness and modal distribution from flanking transmission. Also noted under field conditions are interactions between the coincidence phenomena and the sound field under absorptive room conditions (reverberation time = 0.5 sec), demonstrating that the properties of a partition depend in part on the dwelling unit furnishings. Because all the test environment effects observed resulted in TL values higher than those of a properly adjusted classical lab, the conclusion is drawn that for replicate partitions field TL data may under certain conditions exceed lab TL data by as much as 5 dB when no flanking exists. Specific field TL values are likely to be lower than lab TL values owing to the accumulated effects of flanking, leaks, and assembly differences.

6. SPECIALIZED INSTRUMENTATION

3160. An automatic switching unit for polarographic measurements with various electrodes - Jacobs E.P. - Forsch. Lab., Siemens AG, Munich - J.PHYS.E:SCIENT.INSTRUM. 1975 8/1 (7-8)

An automatic switching unit for the measurements of polarographic reduction potentials with 2 different electrodes is described. The purpose of the unit is to avoid time consuming and complicated handling and to obtain higher reproducibility than is possible with manual operation. Without opening or changing the measuring cell the switching unit allows comparative measurements of various samples or among independent electrode systems.

3161. Cached aluminium foil as packing material for long date preservation of human bone

marrow - KASCHIERTE ALUMINIUMFOLIEN ALS VERPACKUNGSMATERIAL FÜR LANGFRISTIG AUFBEWAHRTES MENSCHLICHES KNOCHENMARK - Severa J. and Blaha M. - Med. Forsch. Inst. Purkyne, Hradec Kralove - RADIOBIOL.RADIOOTHER. (Berl.) 1974 15/6 (741-747)

For long term preservation of human bone marrow for transplants, the construction of a new welding machine for cached foils type SLF 1 was necessary. Based on the examinations performed, it was concluded that cached aluminium foils possess the appropriate properties. The best materials have a foil consisting of 3 layers: polyethylene terphalate/aluminium/polyethylene. It was necessary to develop suitable testing methods for the starting materials and the packing material produced from them.

3162. Some considerations of laboratory drainage systems - Angus J.B. - LAB.EQUIPM.DIG. 1974 12/10 (57-59)

When evaluating available materials for the construction of an in built laboratory drainage system to dispose of aggressive chemical effluents and wastes arising from a hospital, industrial, or research laboratory complex, there are a number of basic factors to be considered. These factors include the nature of the effluent, the discharge temperatures involved, the installation work involved, the life span of the building, and the cost.

3163. An instrument for the measurement of gelation time - Marrs W.M. and Steele D.J. - British Food Manufact. Industr. Res. Assoc., Leatherhead - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (270-272)

The gelation time of a gelling solution can be determined using viscosity time data obtained at constant temperature. An instrument has been developed which enables the gelation time of a solution gelling to be measured at constant temperature. The viscosity is measured in terms of the free fall velocity of spherical drops of carbon tetrachloride through the gelling solution which is measured electronically using a fibre optics detector system. The quantity recorded and displayed digitally by the instrument is the fall time, or the time taken for a drop to fall between 2 fixed points. The gelation time, $t(g)$, can be calculated using an empirical relation which accurately describes the solution viscosity as a function of time up to the point of gelation.

3164. A vacuum ultracentrifuge - Brown M.S. and Morris G.F.R.C. - Australian Def. Sci. Serv., Dept. Def., Weapons Res. Establishm., Salisbury - J.PHYS.E:SCIENT.INSTRUM. 1975 8/4 (291-295)

An ultracentrifuge used to magnetically support and spin small rotors to high rotational speeds is described. Electronic circuits for the magnetic support system and the rotor drive are given. The highest speed attained with the equipment was 17,500 revs⁻¹.

6.1. Metabolism

3165. Two dimensional patterns of tissue metabolic states - Ji S., Chance B., Welch F. and Quistorff B. - Johnson Found., Neurosurg. Dept., Univ. Pennsylvania Med. Sch., Philadelphia, Pa. 19174 - BIOPHYS.J. 1975 15/2(II) (319A)

A photographic method for recording two dimensional patterns of NADH fluorescence of

the rat brain in vivo and in freeze trapped samples was developed. Excitation light at 366 nm is provided by a 100 W water cooled Hg arc with Corning 5840 filter. Fluorescence at 450 nm was recorded. Reflectance at 366 nm was measured with the 366 nm pass filter in order to monitor blood volume changes in the brain. The rat brain cortex subject to anoxia typically showed +30% to +50% changes in fluorescence intensity and -8% to -15% changes in reflectance as determined at specific loci by a microdensitometer (6 rats).

Taking advantage of the fact that low temperature significantly increases the quantum yield of NADH fluorescence, fluorescence photographs of brain slices freeze trapped by conventional methods or by ultra rapid cooling were taken. These photographs suggest that metabolic mapping in 2 and ultimately 3 dimensions is possible.

3166. C 13 NMR relaxation times of isotope enriched glycine in frog muscle - Neville M.C. and Wyssbrod H.R. - Univ. Colorado Med. Cent., Denver, Colo. 80220 - BIOPHYS.J. 1975 15/2(II) (320A)

Longitudinal relaxation times (T₁) of 90% ¹³C enriched glycine accumulated in frog muscle were determined at 1°C at 22.63 MHz and compared with those obtained in free solution. The T₁ values for the C of ¹³Cl glycine in frog muscle (1.1 sec) was about 50% of that observed in free solution (2.1 sec) and was not concentration dependent. The T₁ value for the C of 15.9 mM ¹³C glycine in muscle (14 sec) was about 67% of that of a 20 mM solution (22 sec). These observations indicate that ¹³C nuclear magnetic resonance relaxation times can be obtained for enriched compounds accumulated within biological tissues at concentration near the normal physiological range. The results provide no evidence for substantial binding of glycine by frog muscle at 1°C and are consistent with a 50% reduction in the diffusion constant of glycine within the tissue.

3167. Identification of a linear mathematical model of the kinetics of BSP in the circulation - SIMULATION NUMERIQUE DE LA CINETIQUE SANGUINE DE LA E.S.P. TRAITEMENT PAR IDENTIFICATION D'UN MODELE MATHEMATIQUE - Gaillot J., Bieder A. and Boisvieux J.F. - Adersa Gerbier, 53 Ave. Europe, Vélizy Villacoublay - THERAPIE 1975 30/1 (33-40)

A mathematical model of sulfobromphthalein kinetics in the rat,

6.2. Thermoregulation

3168. Basilar membrane and middle ear vibration in guinea pig measured by capacitive probe - Wilson J.P. and Johnstone J.R. - Dept. Communicat., Univ. Keele - JACOUST.SOCAMER. 1975 57/3 (705-723)

Measurements of amplitude and phase were made on the basilar membranes and middle ear of guinea pigs. A subminiature capacitive probe, giving wide dynamic range and linearity, was used in conjunction with a slave filter to provide continuous frequency response records, and a lock in amplifier to provide high sensitivity

measurements on the basilar membrane down to 40 dB SPL (sound pressure level). The results confirm the general features of previous measurements using various optical and Mossbauer techniques, but also demonstrate that the mechanical tuning properties of the basilar membrane are equally poor at low SPLs and under excellent physiological condition of the cochlea, as indicated by the threshold of the gross cochlear action potential to clicks. The basilar membrane response conforms to the differential cochlear microphonic rather than the much sharper single cochlear nerve fiber threshold curve. Linearity of response at the peak of the mechanical curve was observed over an 80 dB range: significant nonlinearities were observed only for frequencies on the high frequency slope and then only for sound levels above 110 dB SPL. The existence of an amplitude and phase plateau was confirmed. The peak basilar membrane/incus ratio averaged 29 dB independent of cutoff frequency over a range from 16 to 43 kHz, with an rms vibration amplitude at the peak of 500 Å at 100 dB SPL, over cutoff frequencies in the 16 to 26 kHz range.

6.3. Digestive tract

3169. Clinical evaluation of specially designed small intestinal fiberscope (Japanese) - Tada M., Katoh S., Kohli Y. et al. - III Dept. Int. Med., Kyoto Pref. Univ. Med., Kyoto - STOMACH INTEST. (Tokyo) 1974 9/10 (1313-1318)

To date, several types of specific fiberscopes for observing the small intestine have been made, for example, the push type, the rope way type and the 'Sonde' type of intestinal fiberscope (Olympus A 250) which is 2850 mm in length and 5.5 mm in diameter at its flexible portion, the tip of which has a leading weight to guide the fiberscope. The fiberscope is passed per os, and inserted to the small intestine through the esophagus and stomach. However, the fiberscope is too small in width to have a biopsy apparatus. The author used this type of intestinal fiberscope in 17 patients. In 14 cases (82.4%), the descending part of the duodenum could be observed endoscopically, but the fiberscope reached the jejunum in only 7 cases (41.2%) and the ileum in only 2 cases (11.8%). The fiberscope was so flexible that a loop was easily made in the stomach and it was also difficult to make the fiberscope pass the pyloric ring or the bend in the small intestine. In this trial, the mean time of passage was 1 hr to the descending part of the duodenum, about 2 hr to the ligament of Treitz and 6 hr to the ileum.

3170. The characteristics of formant frequency of vowels in connected speech - Kanamori Y. - Res. Inst. Elect. Comm., Tohoku Univ., Sendai - JACOUST.SOCJAP. 1974 30/12 (670-672)

The formant frequency pattern of vowels necessary for research into recognition, synthesis and dynamic perception of vowels in connected speech was investigated and discussed. Using the connected speeches, spoken with 3 different speaking rates (slow, normal and fast) as the

material, the formant frequency patterns of vowels were measured from the sound spectrogram. The vowels of 187 samples were included in the material.

3171. A method of formant extraction utilizing Mel scale - Itahashi S. and Yokoyama S. - JACOUST.SOCJAP. 1974 30/12 (677-678)

The number of pole pairs of auditory significance (or having larger Q factor of resonance) is considered to be 3 or 2. Such poles might be called 'auditory formants'. One method of extraction of these parameters from speech signal by maximum likelihood estimation analysis (ML analysis) is to transform frequency scale into mel scale and to make the number of predictor coefficients adaptively variable so that the poles of fixed number are extracted. The analytical procedure based on the idea mentioned above and some results are described in the following.

3172. A vitreous carbon polymethacrylate composite for dental implants - Hodosh M., Shklar G. and Povar M. - Dept. Oral Med. Oral Pathol., Havard Sch. Dent. Med., Boston, Mass. 02115 - JBIOMED.MATRES. 1975 9/1 (97-108)

A study has been carried out on the structure and surface texture of a new dental implant material composed of vitreous carbon balloons (3 wt % or 6 wt %) and poly(methyl methacrylate). Tooth replica implants using this material had been successfully placed in baboons, and histologic study revealed normal alveolar bone and a peri implant membrane with the connective tissue fibers oriented in a horizontal direction. Square wafers (10 mm x 10 mm x 1 mm) were studied, with the surface sandblasted in one half of the specimens. Light microscopy revealed that in the 3% carbon specimens, the vitreous carbon microballoons were evenly spaced and often appeared to be fragmented within their spaces. Scanning electron microscopic studies revealed a finely porous surface with numerous large craters. Microballoons were often seen within the craters in the nonsandblasted specimens.

3173. An advanced design of the Carlson-Crittenden cup for collection of parotid fluid - Sproles A. and Schaeffer L.D. - Dept. Physiol., Sch. Dent., Univ. South. California, Los Angeles, Calif. 90007 - BIOMAT.MED.DEV.ARTIF.ORGANS. 1974 2/2 (95-101)

The background, fabrication, cleaning, sterilization, and advantages of a nylon parotid collecting cup are described. The easily modifiable material lends itself for use on adults, children, and animals. Using the Carlson Crittenden principles of eliminating direct cannulation and suction on the duct orifice, the nylon 'exogenator' offers a simple method for collecting exogenous oral fluids in a physiologically natural system utilizing glandular kinetics for collection.

3174. New Iglesias resectoscope with simultaneous suction and continuous irrigation - Iglesias J.J. - Div. Urol., Dept. Surg., Coll. Med. Dent. New Jersey, Newark, N.J. - ENDOSCOPY (Stuttg.) 1975 7/1 (36-40)

A new Iglesias resectoscope with

simultaneous suction and continuous irrigation is described. Advantages of this instrument include: no interruption, better endoscopic vision, decreased intravesical pressure during the TUR, shorter operating time, less bleeding, easier teaching and no more wet floor or wet surgeon. Since the entire amount of irrigating fluid is collected, blood loss can be calculated and amount of absorption determined.

3175. Analog model of kinetics of calcium in healthy subjects during alimentary Ca absorption - Brodan V., Hajek M. and Kocian J. - Res. Cent. Clin. Pharmacol., Inst. Clin. Exp. Med., Prague - COMPUT.BIOLMED. 1975 4/3-4 (257-267)

Based on 3 trials, i.e. the administration of ^{47}Ca by the i.v. route, by the oral route, and by simultaneous oral administration of inactive Ca and ^{47}Ca to 5 healthy volunteers, an analog model of the kinetics of calcium in the organism focused on short term changes which take place during the alimentary calcium absorption, was prepared. The model was formed by a system of ordinary simultaneous differential equations which were solved on the Czechoslovak analog computer MEDA T. The 4 compartment model is characterized by 6 rate constants, by the ratio of plasma volume and the extravascular compartment of extracellular fluid, and by 3 regulatory relationships. The regulatory relationships between the digestive tract and plasma reduces the percentage of Ca absorption when its supply is increased; the proportional and integrating regulatory relationship between the Ca pool in the extracellular fluid and the rapidly exchangeable Ca pool (particularly in the skeleton) have a bearing on the exchange of Ca between these 3 compartments. The back flow of Ca from plasma into the bowel plays a very important role in the normalization of the disturbed plasma calcium level. The model is an attempt to describe the movement of Ca in the organism under conditions in which the Ca homeostasis is temporarily impaired by alimentary Ca absorption.

3176. An improved abrasive enamel microsampling device - Wei S.H.Y. and Wefel J.S. - Dept. Pedodont., Coll. Dent., Univ. Iowa, Iowa City, Ia. 52242 - J.DENT.RES. 1975 54/2 (201-205)

An improved enamel abrasive microsampling technique with an electronic preset counter and comparator was designed. In vivo enamel microsamples were obtained from 30 incisors and premolars. The results showed low coefficients of variations for both enamel fluoride concentrations and depths of microsamples in vivo.

6.4. Liver and bile ducts

3177. Use of the 'Ekho 11' apparatus for diagnosing some liver diseases in children - Dvoryakovskii I.V. - Inst. Ped., Acad. Med. Sci. USSR, Moscow - BIOMED.ENGINEERING (N.Y.) 1975 8/3 (171-173)

Ultrasonic diagnosis (echography) is used in such areas of clinical medicine as neurology, ophthalmology, obstetrics and gynecology, and

surgery. Not so long ago the method of ultrasonic diagnosis began to be used, and quite successfully, for diagnosing some liver diseases. The one dimensional and two dimensional methods of echohepatography are used successively in investigations of the liver. The purpose of this study was to establish the possibility of diagnosing certain liver diseases in children by means of just the one dimensional method of ultrasonic investigation. The study was carried out on the mass produced Ekho 11' ultrasonic diagnostic apparatus. All patients were examined also by means of the UZD 5 apparatus, which permitted making sufficiently substantiated conclusions concerning the one dimensional method. Fifty patients were examined of whom 25 children had chronic hepatitis and 25 cirrosis of liver. The age of the patients ranged from 3 to 15 years. The control group was 20 healthy children. The investigations were checked histologically and by 2 dimensional echohepatography. It was concluded that one dimensional echography of the liver permits obtaining sufficiently complete and reliable diagnostic information.

6.5. Blood

3178. Comparative evaluation of blood filters: A study in vitro - Cullen D.J. and Ferrara L. - Dept. Anesth., Harvard Med. Sch., Massachusetts Gen. Hosp., Boston, Mass. 02114 - ANESTHESIOLOGY 1974 41/6 (568-575)

Ultrafiltration of stored blood has been suggested to protect the lung from one cause of acute respiratory failure. To determine the efficacy of fine screen filtration, the effects of different filters on infusion flow rate, debris accumulation, particle removal, and normal constituents of whole blood were measured. After infusing 5 units of stored whole blood, flow rate through the Pall filter was identical to that through the control filter (Fenwal 170 μ), 80 g/min. However, the Swank filter (17 g/min) and the Fenwal microaggregate filter (13 g/min) retarded flow rate significantly when compared with the Pall and control filters. The Bentley filter stopped flow after one unit of blood was infused. The Swank and Pall filters accumulated twice as much debris as the control Fenwal filter (5 mg/g versus 2.2 mg/g whole blood). Screen filtration pressure was reduced to 10% of control with Pall filtration and 0.7% of control with Swank filtration. Ultrafiltration of fresh whole blood did not affect normal blood constituents other than reducing platelet count by 64% with the Swank filter. Ultrafiltration need not be harmful to blood or flow rate, and is highly effective and practical. Its use in massive transfusion therapy is recommended.

3179. Presentation of a transfusion accelerator. Electric blood pump - PRESENTATION DUN ACCELERATEUR DE TRANSFUSION. POMPE A SANG ELECTRIQUE - Rouet C., Le Guyader B. and Roche J.F. - CAHANESTH. 1974 22/6 (651-653)

A description is given of an electrical pump for accelerated transfusion of blood. The

apparatus is relatively inexpensive and easy to move. 4 years' experience of its use in an operation theater and an intensive care unit is satisfactory.

3180. Standard methods for the determination of erythrocyte and plasma volume -

STANDARDMETHODEN FUR DIE BESTIMMUNG DES ERYTHROZYTEN UND PLASMAVOLUMENS - Steinbockstr. 9, Ulm/Donau - BLUT 1974 29/6 (422-433)

In most cases the erythrocyte volume (EV) can be determined with marked cells and the plasma volume (PV) with marked proteins and the results are reproducible. The 'true' total blood volume (BV) results from the addition of the two values. The calculation of the full blood volume from the values of the venous hematocrit (Hv) and either EV or PV, widely used in routine diagnosis, is less reliable. The whole body hematocrit (H(B)) derived from direct measurements of EV and PV is in normal people lower than Hv. In the estimation of the EV with ^{51}Cr and of the PV with marked albumin the H(B)/Hv quotient normally is 0.9. In patients with considerable splenic enlargement it rises to over 1, in various diseases it shows an increased variability towards the norm. For marking erythrocytes ^{51}Cr is most suitable. Other radioisotopes (e.g. ^{11}CO , ^{32}P , ^{42}K , ^{86}Rb , $^{99}\text{Tc}(\text{m})$) are much more rapidly elutriated from the cells in vivo and not generally available. For simultaneous marking ^{32}P is recommended at present of which there is extensive experience. However, recent investigations show that stable erythrocyte marking is also possible with $^{99}\text{Tc}(\text{m})$ and after treatment with zinc chloride. For PV estimation marked serum albumin is used most frequently. For marking plasma proteins iodine (^{131}I , ^{125}I) is especially suitable. A final judgement on a possible use of the short lived isotopes $^{99}\text{Tc}(\text{m})$ or $^{113}\text{In}(\text{m})$ is not yet possible.

3181. Geometry of the human erythrocyte. I.

Effect of albumin on cell geometry - Jay A.W.L. - Div. Med. Biophys., Fac. Med., Univ. Calgary - BIOPHYSJ. 1975 15/3 (205-222)

The effects of albumin on the geometry of human erythrocytes have been studied. Individual red cells hanging on edge from coverslips were photographed. Enlarged cell profiles were digitized using a Gradicon digitizer. Geometric parameters including diameter, area, volume, minimum cylindrical diameter, sphericity index, swelling index, maximum and minimum cell thickness, were calculated for each cell using a CDC 6400 computer. Maximum effect of human serum albumin was reached at about 1 g/l. Studies of cell populations showed decreases in mean cell diameter of up to 6%, area 6%, and volume 15%, varying from sample to sample. The thickness of the rim was increased while that at the dimple was decreased. Studies of single cells showed that area and volume changes do not occur equally in all cells. Cells with lower sphericity indices showed larger effects. In the presence of albumin, up to 50% of the cells assumed cup shapes (stomatocytes). These cells had smaller volumes but the same area as biconcave cells. Mechanical agitation could reversibly induce biconcave cells to assume cup

shapes without area or volume changes. Experiments with defatted human albumins showed that the presence of bound fatty acids in varying concentrations does not alter the observed effects. Bovine serum albumin has similar effects on human erythrocytes as human serum albumin.

3182. The effect of haematocrit on the resistivity of human blood at 37°C and 100 kHz - Hill D.W. and Thompson F.D. - Res. Dept. Anaesth., Roy. Coll. Surg. England, London - MED.BIOENGINEERING 1975 13/2 (182-186)

In order to be able to employ the electrical impedance method for the measurement of cardiac output in patients on haemodialysis where a wide range of haematocrits may be encountered, a knowledge of the relationship between the resistivity and haematocrit of blood is required. A linear least squares relationship has been determined for human blood at 37°C and 100 kHz over the haemotocrit range from 14 to 45%.

3183. Application of the diffusion dipole to modelling the optical characteristics of blood - Hirko R.J., Fretterd R.J. and Longini R.L. - Electr. Engin. Biotechnol. Program., Carnegie Mellon Univ., Pittsburgh, Pa. - MED.BIOENGINEERING 1975 13/2 (192-195)

Modelling the diffusion optical characteristics of blood is quite useful in the study of oximetry. The diffusion dipole of Fretterd and Longini (1973) is applied to the solution of the diffusion equation for photons in a blood and saline mixture and an exact solution is obtained. Comparisons are made among this solution and other commonly used techniques. Preliminary measurements on a blood and saline mixture are shown in comparison to the model solutions. The advantages of using diffusion dipole approach are elaborated.

3184. A simple method of continuous blood withdrawal - Nicholls M.G. and Arcus A.C. - Med. Unit, Princess Margaret Hosp., Christchurch - NZ.MEDJ. 1974 80/530 (546-548)

It is well known that the concentration of many blood constituents fluctuates considerably, making an overall assessment of blood levels in any one patient difficult. A method of continuous blood withdrawal which utilises readily available material is described. Use of this technique allows one to obtain integrated levels of blood constituents. The integrated plasma growth hormone concentrations in 2 patients are presented, to illustrate one application of the method.

6.7. Circulation

3185. An electronic method for measuring the heart frequency of the waterflea: Daphnia pulex - Postmes Th.J., Nacken G. and Nelissen R.G. - Dept. Med. Phys., St. Annadal Hosp., Maastricht - EXPERIENTIA (Basel) 1974 30/12 (1478-1480)

A new method for accurate determination of the heart frequency of transparent water

organisms (Daphnia pulex 500/min) with a microprojector by use of a light dependent resistance (LDR), is described.

3186. Long term telemetry of direct arterial blood pressure in unrestricted hypertensives - Kroenig B., Dufey K., Reinhardt P. et al. - I Med. Klin., Johannes Gutenberg Univ., Mainz - BIOTELEMETRY 1974 1/3 (117-131)

The variability of resting arterial blood pressure is greater in hypertensive than in normotensive men. Little is known about the superimposed blood pressure alterations, induced by everyday activities, since the indirect method fails to give exact information. To permit continuous direct recording of blood pressure in a greater series of unrestricted hypertensive patients, the following telemetry unit was developed and applied by modification of the methods of Bachmann and Thebis, and Bevan et al. A small plastic catheter (0.8 x 1.2 x 120 mm) was inserted percutaneously into the brachial artery under local anaesthesia. It caused almost no discomfort to the patient and left movement of the patient's arm unrestricted. The miniature transducer (Statham SP 37) was fixed to the patient's upper arm. The system was flushed continuously with a microvolume of 3.0 or 6.0 ml/hr, the portable reservoir being pressurized by inflating a surrounding cuff. The whole portable equipment, including battery modulator and transmitter, could be packed together in a convenient bag weighing approximately 2.3 kg. The patients' movements were unrestricted within the area of the transmitter range (about 600 m). The data were recorded simultaneously on an original chart (paper speed usually 0.5 mm/sec) and a magnetic tape, leaving the possibility of stretching or condensing the registered data. The method proved effective in over 200 long term studies (24 to 60 hr); serious complications did not occur.

3187. A new technique for monitoring spontaneous respiration - Gordon D.H. and Thompson W.L. - Johns Hopkins Hosp., Baltimore, Md. 21205 - MED.INSTRUMENT. 1975 9/1 (21-22)

A thermistor is positioned in the posterior pharynx via a nontoxic, flexible catheter. The posterior pharynx receives nasal and oral airflow, and can be catheterized comfortably and safely. Reliability is enhanced by electronic signal conditioning and detection circuits that respond only to predetermined minimum changes in flow so that shallow breathing is detected, but slow changes in the relative position of the thermistor within the pharynx are not detected as respiration.

3188. Radiation hygienic problems emerging during the first domestic application of nuclear powered pacemakers (Hungarian) - Urban A. and Soos L. - Sugaregeszegugyi Osztal, Fovar Kozeges. Jarvanyugyi Allom, Budapest - ORV.TECHN. 1974 12/2 (45-47)

The first home use of a nuclear powered pacemaker is reported. This instrument constitutes a special instance of a closed radiation source from the point of view of radiation protection as it is in steady movement

while implanted into the living body, and therefore it may imply a risk not only to its wearer but to its known and unknown environment as well.

3189. The filtration limitations of ultrapore filters
- Gervin A.S., Mason K.G. and Wright C.B. - Div. Surg., Inst. Res., Walter Reed Army Med. Cent., Washington, D.C. 20012 - SURGERY 1975 77/2 (186-193)

The filtration effectiveness of 4 commercially available microaggregate filters was determined using 14 day old stored human blood in a constant infusion system. All filters significantly reduced the volumes of microaggregates contained in 500 ml. of blood. Three of the filters tested either occluded or failed to effectively remove microdebris from larger volumes of blood. These filters should be employed only for single blood transfusions. The fourth filter of grid design, was effective in removing microdebris from 2,000 ml. of blood, the limits of the study. When employing microaggregate filters in massive transfusion situations for the prevention of pulmonary dysfunction, filtration characteristics and efficiencies of the filters employed must be known so that inadvertent administration of microdebris to the patient might be prevented.

3190. Mitral valve replacement with the Smeloff Cutter prosthesis. Experience with 154 patients and comparison with results of replacement with a Starr Edwards prosthesis - Oxman H.A., Connolly D.C. and Ellis F.H. Jr. - Mayo Clin. Mayo Found., Rochester, Minn. 55901 - J.THORAC.CARDIOVASC.SURG. 1975 69/2 (247-254)

Mitral valve replacement with the Smeloff Cutter (S-C) prosthesis was performed in 154 patients between September, 1965, and January, 1970. In 84, only the mitral valve was replaced; in the remainder, other valves were reconstructed or replaced. The hospital and late mortality rates for isolated replacement were 6 and 25%, respectively. Comparable figures for the Starr Edwards (S-E) (Models 6000 and 6120) prosthesis during this period were 11 and 23%. Similar rates of thromboembolism were associated with the use of either prosthesis in surviving patients (27% for the S-C valve and 30% for the S-E valve). In spite of the acceptable hospital mortality rate for the S-C valve, it is not now considered suitable for clinical use because of the high late mortality rate and the high risk of thromboembolism that accompany its use.

3191. Development of a pacemaker monitor with cardiac simulator - Steiner T.O. - Aerospace Med. Div., USAF Sch. Aerospace Med., Brooks AFB, San Antonio, Tex. 78235 - AEROMED.REV. 1975 SAM-TR-75-7 (9p.)

A cardiac pacemaker monitoring system was developed for use in testing cardiac pacemakers in radiofrequency fields. It provides for both continuous monitoring of the pacemaker output and simulating normal cardiac activity at the pacemaker leads. Fiber optics techniques were used to provide the necessary electrical isolation of the pacemaker. Tests have shown that the monitoring system does not significantly affect pacemaker response to RF fields.

3192. Clinical and hemodynamic comparisons of Kay-Shiley, Starr-Edwards No. 6520, and Reis-Hancock porcine xenograft mitral valves - Brown J.W., Myerowitz P.D., Cann M.S. et al. - Nat. Heart Lung Inst., Clin. Surg., NIH, Bethesda, Md. - SURGERY 1974 76/6 (983-991)

Mitral valve replacement (MVR) in a patient with a small or normal size left ventricle necessitates the use of a low profile prosthesis or a porcine xenograft. This retrospective study summarizes the clinical and hemodynamic findings in 88 patients in whom such valves were implanted. Isolated MVR was performed in 74 patients and MVR plus tricuspid valve replacement with the same type of prosthesis in 14 patients. Preoperative hemodynamic findings and the number of patients in each group were comparable. Early (<30 days) and 6 mth mortality rates were Kay Shiley (KS) 33 and 48%, Starr Edwards No. 6520 (SE) 14 and 25%, and porcine xenografts (P) 6 and 12%. The incidence of fatal postoperative arrhythmias was 11% with KS valves, 11% with SE valves, and 6% with P valves. Postoperative thromboembolic complications occurred in 33% of patients with KS valves, 28% with SE valves, but were not observed in any patient with a P valve. The hemodynamic performance of all 3 valve types was similar as measured at postoperative catheterization; the calculated orifice areas and diastolic gradients were not significantly different in the 3 groups. However, the significantly lower early mortality rate and the absence of thromboembolic complications make the porcine xenograft a superior choice for patients with normal or small size left ventricles.

3193. A method for injecting substances into the circulation to reach rapidly and to maintain a steady level. With examples of its application in the study of carbohydrate and amino acid metabolism - Daniel P.M., Donaldson J. and Pratt O.E. - Dept. Neuropathol., Inst. Psychiat., London - MED.BIOENGINEERING 1975 13/2 (214-227)

The method devised for rapidly obtaining a known concentration of a soluble substance in the bloodstream and maintaining this concentration steadily, is based upon an accurate knowledge, and a mathematical analysis, of the rate at which such a substance leaves the vascular system after it is injected. It is assumed as a first approximation that there is a first mainly intravascular compartment into which the substance is injected. The substance then passes into a second, extravascular, compartment which is complex. The electrical model of the biological system is composed of one capacitor representing the first biological compartment and another representing the second compartment, with resistors regulating the flow of current between these capacitors, corresponding to movements of the injected substance. In biological experiments the rate at which the substance leaves the first compartment is measured. The rate is represented in the electrical model by the rate of fall of the voltage on a capacitor. For any given voltage to which the capacitor is charged it is possible to calculate the rate at which the current has to be supplied to maintain this

voltage constant. From these results it is possible to calculate the rate at which the substance must be injected to maintain a raised concentration in the blood. The mathematical methods used in the work are described, as are details of the electronically controlled syringe which is which is used to inject the substance. Examples are given of the application of the method in physiological experiments in which a number of the constituents of blood plasma, with or without radioactive labeling, were used.

3194. Program for the computation of various parameters of contractility using a microcalculating machine - PROGRAMM ZUR

BERECHNUNG MEHRERER KONTRAKTILITÄTSPARAMETER AUF EINEM KLEINSTRECHNER - Guettler P. - Arbeitsgruppe Med. Techn. Elektron., Med. Akad. Carl Gustav Carus, Dresden - ZGES. INN. MED. 1975 30/2 (55-58)

This program is outlined for a microcalculating machine type Hewlett Packard 9810 A. It involves 9 parameters of contractility, calculated from left ventricle pressure values in dogs with shock. A large number of pressure curves is evaluated by the machine. This helps to determine the validity of different parameters of contractility.

3195. Contractile impulse conduction in the embryonic heart - Challice C.E. and Viragh S. - Dept. Phys., Univ. Calgary - BIOPHYS.J. 1975 15/2II (256A)

As part of a study of the development of the atrio ventricular (A V) conduction system in the heart of the mouse it was found that at 12 days of embryonic life a structure appeared in the dorsal wall of the A V canal which links the atrial muscle with the ventricular trabeculae. This structure, designated the A V ribbon, appeared to give rise to the anlage of the A V node and the His bundle a day or so later. However, until the invasion of the connective tissue separating atria and ventricles (which ultimately becomes the annulus fibrosus) there remained muscular continuity along the ventral wall of the A V canal, providing a pathway to the atrio bulbar junction which is geometrically shorter than that to the farther parts of the primitive ventricular chambers. Even so, there was a clear and well defined sequence of contraction of sinus node atrium ventricles bulbus. The contractile impulse was not observed to cause contraction in the bulbus before the ventricles despite the shorter pathway, in which no evidence of muscular discontinuity was found. Attempts were made to account for this observation. It seems possible, despite the physical contact at the atrio bulbar junction, which occurs during the twisting process in the heart's embryonic development, that functional electrical transmission is not established at this point. It is also possible that there may be an electromechanical ingredient in the mechanism of maintenance of the contractile sequence (Pollack, J., 1974). The experimental evidence does not permit conclusive discrimination between the possibilities.

3196. Haemolysis in ball valves with overlapping and non overlapping closing mechanisms. An experimental study - Fortune R.L. and Henze A.

- Thorac. Surg. Clin., Karolinska Sjukh., Stockholm - SCANDJ. THOR. CARDIOVASC. SURG. 1975 9/1 (1-4)

Overlapping and non overlapping closing mechanisms of the ball valve type were evaluated in regard to rates of haemolysis. The test chamber used in this experimental study permitted an almost physiological valve function in a minimal volume of human whole blood. An overlapping closing mechanism was represented by the Starr Edwards aortic silastic ball valve and a non overlapping one by the Smeloff Cutter aortic silastic ball valve. Red cell destruction was significantly lower with a non overlapping ball than with an overlapping one on valve closure. The magnitude of red cells destroyed in 80 ml of blood/hour was, on average, 0.29% and 0.73% respectively. The Bjork Shiley tilting disc valve was tested as a control and accounted for a red cell destruction of 0.20%. Assuming a linear progression of haemolysis with time, a blood volume of 4,800 ml, and a normal erythrocyte survival time of 120 days, the red cell destruction attributable to the prosthetic closing mechanisms could be extrapolated to in vivo conditions. The production rate of red cells by the bone marrow would have to increase by 14% in a patient with a single Smeloff Cutter valve replacement in order to prevent the development of anaemia. In a patient with a single Starr Edwards valve replacement, a corresponding value of 34% was calculated. These values would increase two or three fold after double or triple valve replacement. An overlapping closing mechanism has again been shown to cause a significantly larger degree of haemolysis than a non overlapping mechanism, presumably due to the mechanical crushing of red cells.

3197. Study of pig valve heterografts by X ray diffraction - Huc A, Planche Cl, Weiss M. et al. - Lab. Structures, Cent. Techn. Cuir, Lyon - J.BIOMED.MAT.RES. 1975 9/1 (79-95)

The study of collagen fibers by X ray diffraction, utilizing semiquantitative indices for appraisal of 'structuration' and 'orientation', was applied to 30 aortic valve grafts. These grafts, of pig origin, were studied in the fresh state after tanning with aldehydes, and after having been implanted in patients for at least 18 mth. It was shown that the collagen fibers are preferentially orientated parallel to the transverse axis of the valve cusps, and that this arrangement, enhanced by tanning, had a tendency to disappear in the post implantation samples. The structuration index which concerns the fibril network was also augmented by tanning, and was found a little high or slightly diminished in post implantation cusps. Evidence for a new compound, probably fibrin, was found in the diffraction patterns of implanted cusps, but crystallized calcium was noticeably absent.

3198. Fabrication of hollow vascular replicas using a gallium injection technique - Meiselman H.J. and Cokelet G.R. - Dept. Physiol., Univ. South. California Sch. Med., Los Angeles, Calif. 90033 - MICROVASC. RES. 1975 9/2 (182-189)

A technique is described for the fabrication of hollow vascular replicas of microcirculatory

beds. The procedure, which employs pure, elemental gallium as the injection medium, produces casts which replicate the 3 dimensional architecture of the vascular system down to and including the capillary level. The resulting hollow replicas derived from these casts are suitable for pressure flow measurements as well as microscopic observation of blood flow dynamics.

3199. Soviet vector electrocardioscope type 4M (Hungarian) - Tarjan J., Papp I. and Oletics K. - II Bel. Klin., Orvostud. Egyet., Pecs - ORV.TECH. 1975 13/2 (42-45)

The technical data of the Soviet Type M 4 Vector Electrocardioscope and the method of presentation of the 3 plane lead arrangement of Akulinichev and that of Frank's corrected lead arrangement, are discussed. The instrument was found to be technically reliable, whereby vector loops of evaluable quality can be recorded.

3200. Non invasive automatic measurement of blood pressure (Danish) - Alsner T. and Kann T. - Anaestesiad. II, Kobenhavns Amts Sygeh., Gentofte - UGESKR.LAEG. 1975 137/14 (780-783)

Three types of apparatuses for non invasive automatic measurement of blood pressure (Philips type XV 1030/10, Haematograph type Mark 2 (Godart) and Arteriosonde (Doppler, Roche)) were submitted to clinical trial and compared with simultaneous recording of blood pressure measurements by the Korotkoff method. Philips type XV 1030/10 proved immediately to be far too unreliable for practical use, in the authors opinion. Where the remaining 2 types were concerned, the Haematograph was found to possess an uncertainty as compared with the Korotkoff method with a standard error (SE) of 4 to 5, whereas the Arteriosonde gave values of only 2 to 3 (Tables I and II). Further, the Haematograph was found to be extremely sensitive to movements of the arm on which registrations were undertaken which resulted in approximately 10% errors or absence of registrations. This did not occur with the Arteriosonde. It is concluded that the Arteriosonde is comparable with the Korotkoff method where accuracy is concerned but is no better than this method.

3201. Recording the cardiac interbeat interval distribution - Mansourian P., Masironi R., Nicoud J.D. and Steffen P. - Off. Sci. Technol., World Hlth Org., Geneva - JAPPLPHYSIOL 1975 38/3 (542-545)

A compact device is described, which picks up the R wave of the ECG, calculates the duration of successive interbeat intervals, classifies them in eight classes and stores the respective counts in an integrated circuit register. The distribution of intervals counted over the experimental period is retrieved through a separate numerical readout device.

3202. Experimental studies on blood flow in the vascular area of the subdiaphragm using a newly developed pulse wave pump - EXPERIMENTELLE UNTERSUCHUNGEN UBER DIE DURCHBLUTUNG DES SUBDIAPHRAGMALEN GEFASSGEBIETS MIT EINER NEUENTWICKELTEN PULSWELLENERZEUGENDEN PUMPE -

Kivelitz H., Raff W.K., Kremer K. et al. - Chir. Klin., Univ. Dusseldorf - THORAXCHIR.VASK.CHIR. 1975 23/1 (6-14)

A new developed partial artificial heart system is presented, which allows pulsatile perfusion of vital organs. The results presented reveal the possibility to duplicate pressure curves and peak systolic pressure in the perfused area similar to physiological preoperative measurements. The kidney function remains intact. Angiographically there is no damage of the kidney vessels evident. The results are compared with data of other investigators. Especially their opinions about the disturbance of renal flow and function under nonpulsatile conditions are critically evaluated. A possible connection between the postoperative renal failure after cardio pulmonary bypass and non pulsatile perfusion and other pathophysiological mechanisms are discussed.

3203. The cardiotape machine - Graham I.M., Gallagher F., Hickey N. and Mulcahy R. - Card. Dept., St Vincents Hosp., Dublin - LANCET 1975 1/7911 (838-839)

The cardiotape, is a modified cassette tape recorder weighing 3 kg. and measuring 28x24x8 cm. It differs in external appearance from a conventional cassette recorder in having a lead selector switch identical to that used in a conventional electrocardiograph and an input socket for the 5 E.C.G. leads. Commercially available cassettes are used.

3204. Effect of transducer placement on echocardiographic measurement of left ventricular dimensions - Popp R.L., Filly K., Brown O.R. and Harrison D.C. - Cardiol. Div., Stanford Univ. Sch. Med., Stanford, Calif. 94305 - AMERJ.CARDIOL. 1975 35/4 (537-540)

An echocardiogram from the left ventricle may be used to estimate left ventricular volume and rate of circumferential fiber shortening, to measure posterior wall and interventricular septal thickness, and to evaluate the normality of septal motion. Extended application of this technique in the laboratory emphasized the need for a more standardized means of transducer location and direction. The effect of placing the ultrasonic transducer in several intercostal spaces along the left sternal border was tested in 14 patients. Variability in the left ventricular dimension and the difference in this dimension from end diastole to end systole were greater than for duplicate measurements from the same interspace. A system was developed for more consistent placement of the transducer in each patient, using intracardiac landmarks and observation of transducer orientation to record specific cardiac structures.

3205. The reliability of pacemaker electrode leads - Green G.D. - Dept. Clin. Phys. Bio Engin., West Scotland Hlth Boards, Glasgow - J.ELECTROCARDIOL. 1975 8/2 (195-200)

Extensive experience with Medtronic pacemakers was obtained in Glasgow, where over 400 patients received their primary implant. In a review covering a period of 7.5 years, ending in December 31, 1973, the technical reliability of

electrode leads is considered in terms of failed implant lifetimes and incomplete implant lifetimes. Too few myocardial electrode leads were used to reach firm conclusions about its reliability, but the incidence of failures with the endocardial bipolar electrode lead (Type 5818) was small and it was evidently more reliable than its predecessor (Type 5816). It is suggested that more time should elapse before the present design of bipolar catheter can be claimed to match the theoretical implant lifetimes of generators with the long life power sources. Insulation failures are usually of no immediate clinical significance whereas any broken conductor is hazardous. The use of multi stranded conductors is therefore advocated. All pacemakers should be retrieved after the deaths of patients.

3206. The importance of blood resistivity in the measurement of cardiac output by the thoracic impedance method - Hill D.W. and Thompson F.D. - Res. Dept. Anaesth., Roy. Coll. Surg. England, London - MED.BIOLENGINEERING 1975 13/2 (187-191)

Twenty simultaneous pairs of cardiac output values from patients who did not have valvular abnormalities were obtained by the radioisotope method and the electrical impedance method of Kubicek et al. (1966). If a standard value of 150 cm was assumed for the resistivity of each patient's blood, the mean value for the impedance cardiac output was 14.5% high compared with the mean radioisotope value. In this study the patients' haemotocrits ranged from 20 to 48%. Inserting the appropriate value of the resistivity for each patient into the stroke volume equation of Kubicek from the data of Geddes and Sadler (1973) made the mean impedance value 10.3% low compared with the mean isotope value. The use of measured resistivity data made the mean impedance cardiac output value 21.5% lower than the mean isotope value. The correlation coefficient between the impedance and isotope techniques was 0.61 for the standard value of resistivity of 150 cm. Using the resistivity data of Geddes and Sadler (1973) the correlation became 0.87 and with the authors' data it was 0.88.

3207. A portable mains operated d.c. defibrillator of unusual design - Machin J.W. - Bio Med. Engin. Unit, North Stafford Polytechn., Stoke on Trent - MED.BIOLENGINEERING 1975 13/2 (240-244)

The philosophy, design and operation of a portable defibrillator are described. The instrument is mains operated but dispenses with a high voltage transformer and employs electrolytic capacitors. The weight is about 11 kg not including electrodes.

3208. New microtransducer for physiological pressure recordings - Hok B. - Electron. Dept., Teknikum, Uppsala Univ., Uppsala - MED.BIOLENGINEERING 1975 13/2 (279-284)

A new pressure microtransducer, which utilises a closed air volume instead of a diaphragm as the elastic medium, has been developed. Volume variations are transferred into an electrical signal via an electrolytic conductance cell, which is situated adjacent to the air volume.

This arrangement eliminates the problems associated with diaphragm mounting and also gives high pressure sensitivity. The inherent nonlinearity of the input output characteristics has a simple analytical form and can therefore be effectively reduced by an inexpensive analogue network. It is also shown that the thermal expansion of the air can be balanced by the temperature coefficient of the conductance cell. The overall performance of the sensor fulfils the requirements of most biomedical applications, and its simple and rugged construction should make it suitable for routine work.

3209. Benefit/risk analysis of cardiac pacemakers powered by Betacel promethium 147 batteries - Smith T.H., Greenborg J. and Matheson W.E. - Donald W. Douglas Lab., McDonnell Douglas Corp., Richland, Wash. 99352 - NUCL.TECHNOL. 1975 26/1 (54-64)

Cardiac pacemakers powered by Betacel¹⁴⁷ Pm nuclear batteries are undergoing clinical evaluation in Europe and the United States. This benefit/risk study analyzes the potential effects from unrestricted use of 20,000 pacemakers powered by these betavoltaic batteries. The beneficial effects of this device (lives saved and reduced medical expenses) result from improved reliability and operating lifetime (9 yr) compared with widely available chemical batteries of substantially shorter life (2 1/2 yr). Calculated benefits are \$16,800,000/yr savings to society and 76 lives (800 life years) saved per year. Risks to the patient and the general population are generally less than those from natural accidents such as landslides and lightning strikes. The calculated benefit/risk ratios of 180 in terms of lives and 440 in monetary terms are in the range commonly accepted by the public.

6.8. Respiration

3210. Quality control: undefined and underused - Simkins T. - CVP J.CARDIOVASC.PULM.TECHNOL. 1974 2/4 (19-24)

The accuracy of blood gas analysis is discussed. One of the main errors is malfunctioning equipment. Quality control by means of duplicate machines is discussed.

3211. Device for exposing the respiratory tract of the rat to medicinal aerosols - Smith S.W. and Spurling N.W. - Allen and Hanburys Res. Ltd., Ware - LAB.PRACT. 1974 23/12 (717-721)

The paper describes an apparatus in which only the nasal region of the head of rats, i.e. the portion anterior to the eyes, is exposed to the aerosol. It has been successfully employed since 1971 in a toxicologic laboratory studying therapeutic aerosol preparations. An atmosphere containing aerosol is generated from standard cans fitted with metering valves as used for clinical treatment. A pneumatic system is employed to control the process and 30 rats may be exposed simultaneously on each unit. The apparatus has functioned well in practice, the chief disadvantage which is inherent in any apparatus of this type, is the considerable amount

of labour involved in loading and unloading as well as in cleaning the component parts. Brief details are given of a six mth toxicologic study for which the apparatus was used.

3212. Use of the bird Mark 2 respirator as a mechanical sigh with bird pressure sensitive respirators - Lutes W.J. - Dept. Inhalat. Ther. Pulmon. Funct., Proctor Commun. Hosp., Peoria, Ill. - RESP CARE 1975 20/2 (149-154)

The mechanical sigh is accomplished by using a modified bird Mark 2 time cycled ventilator spliced into the inspiratory power driveline of any bird pressure sensitive ventilator, with a 9993-358 tee. Technically, the idea consists of adjusting the control settings of the Mark 2 to add inspiratory flow and pressure to the pressure sensitive machine at a predetermined time. This may be accomplished by loosening the retaining limit screws on the control knobs of the Mark 2. The inspiratory time is then adjusted by turning the control until the inspiratory mode of the machine triggers for approximately 3 to 6 sec duration. The flow/pressure control is then turned counterclockwise until the pressure leaving the outlet is 42 to 48 psig. The expiratory time may then be decreased until the Mark 2 will cycle only at the desired sigh interval.

3213. Automatic flow interruption bronchoscope: a laboratory study - Jardine A.D., Harrison M.J. and Healy T.E.J. - Dept. Anaesth. Stud., Gen. Hosp., Nottingham - BRIT.J.ANAESTH. 1975 47/3 (385-389)

A laboratory assessment of a ventilating bronchoscope incorporating automatic flow interruption suggests that it will safely provide adequate ventilation. This study reports the assessment of a bronchoscope incorporating the venturi principle and time cycled automatic flow interruption of the ventilating gases. Tests were performed to determine the effects of the time cycled interruption of the tidal volume, the oxygen concentration and the volume of air entrained.

3214. The rodent ultrasound production mechanism - Roberts L.H. - Dept. Life Sci., Polytechn. Cent., London - ULTRASONICS 1975 13/2 (83-88)

Rodents produce 2 types of sounds, audible and ultrasonic, that differ markedly in physical structure. Studies of sound production in light gases show that whereas the audible cries appear to be produced, as in the case of most other mammals, by vibrating structures in the larynx, the ultrasonic cries are produced by a different mechanism, probably a whistle. 'Bird call' whistles are shown to have all the properties of rodent ultrasonic cries and to mimic them in almost every detail. Thus it is concluded that rodents have 2 distinct sound production mechanisms, one for audible cries and one for ultrasonic cries.

3215. An acrylic tracheostomy talk plug - Donaldson M.J. - Veter. Res. Hosp., Chicago, Ill. - RESP CARE 1975 20/3 (260)

The acrylic talk plug provides all the requirements considered essential for good tracheal hygiene, with the advantage of minimal air leaks so the patient can have a near normal

voice. Any dental laboratory can make such a plug, using the same technique as for dentures.

6.9. Reproductive system

3216. Volume measurements of unequal breasts - Kirianoff T.G. - 2080 Century Park East, Los Angeles, Calif. 90067 - PLAST.RECONSTR.SURG. (Baltimore) 1974 54/5 (616)

A method for the volumetric measurement of asymmetrical breasts, prior to an augmentation mammoplasty, is described. This has proven beneficial in obtaining breasts of equal size.

3217. A new vacuum extractor: the Soft Cup (Dutch) - Thiery M., Van Kets H., Van Eyck J. and Yo Le Sian A. - Klin. Verlosk., Akad. Ziekenh., Rijksuniv., Gent - T.GENEESK. 1975 31/5 (256-259)

A Japanese soft plastic vacuum extractor cup (Soft Cup) was used for a trial. Built similar to the 19th century Simpson ventouse it relies on the sole vacuum as the adhesion medium and no 'chignon' is formed. Introduction of this cup in the vagina may be difficult and the sharp edges have produced minor mucosal lesions. A series of 20 patients was delivered by this new device. All were fully dilated and intraamniotic pressure, fetal tachometry and tractive power were recorded. The cup was torn off in 3 cases and delivery was completed spontaneously or with the Malmstrom cup. No harmful effects on the newborns were observed and an artificial caput succedaneum was almost absent. The Soft Cup seems less effective in comparison with the original Malmstrom device and should be used only for easy extractions.

6.10. Urinary tract

3218. A new urine flowmeter of simple type (Danish) - Bay Nielsen H., Moller Hansen H. and Larsen E. - Urol. Afd. A, Kobenhavns Amts Sygeh., Glostrup - UGESKR.LAEG. 1974 136/48 (2673-2675)

A cheap and robust flowmeter of simple construction is described. Micturition is undertaken in privacy and may be registered by all types of staff. The principle of the flowmeter is to fractionate micturition by directing the urine down into a series of chambers which move at a constant rate.

3219. The influence of geometrical factors in ¹³¹I hippuran renography - Nimmon C.C., McAlister J.M. and Cattell W.R. - Radioisot. Dept., St Bartholomew's Hosp., London - PHYS.MED.BIOL. 1975 20/1 (67-79)

Using a particular collimated NaI scintillation detector and a kidney phantom containing ¹³¹I, the dependence of the resulting count rates on collimator kidney geometry was determined. These results were used to calculate the geometrical contribution to the error in the measurement of relative effective renal plasma flow (RFP) by ¹³¹I Hippuran renography. When

radiographic and ultrasonic methods of localizing the kidneys are employed, this error is found to follow a normal distribution with a SD of 2.6% in the case of equally divided function.

Combination of this error with that from natural movement and statistical fluctuations, as observed using a dose of 10 μ Ci ^{131}I Hippuran, led to the estimation of a corresponding potential error of 11%. Values of the potential error, which is defined as the 99% probability range, were calculated covering the range of RFP.

6.11. Nervous system

3220. A pressure displacement transducer for measuring brain tissue properties in vivo - Walsh E.K. and Schettini A. - Coll. Engin., Univ. Florida, Gainesville, Fla. 32611 - JAPPLPHYSIOL 1975 38/1 (187-189)

A transducer system is described which measures simultaneously the pressure and displacement as the transducer is inserted into the intracranial system. The measurements are made in vivo and with the dura arachnoid membranes intact. The short time mechanical response of the system as well as the time dependent relaxation and creep properties can be determined.

3221. A chronic electrode implantation technique for sub mammalian vertebrates - Skydell J.L. and Capranica R.R. - Sect. Neurobiol. Behav., Cornell Univ., Ithaca, N.Y. 14853 - ELECTROENCEPH.CLIN.NEUROPHYSIOL 1975 38/3 (325-328)

A new microelectrode implantation technique is described for recording electrical activity in the brains of awake, unrestrained small animals. The technique employs a miniature heating element and wax seal to enable movement of the microelectrode. Preliminary results in toads (*Bufo americanus*) are presented as an example of the technique.

3222. Some applications of the amplitude and frequency analysis of the EEG - Tikal K. - Inst. Pharmacol., Fac. Med. Hyg., Charles Univ., Prague - ACTA UNIV.CAROLSER.MED. (Praha) 1973 19/5-6 (343-358)

Some results of the amplitude analysis of the EEG curve, and some possibilities for applications of this analysis are described. The question is discussed of representing data obtained by means of a band frequency analysis of the EEG curve. The possibilities of utilizing this analysis for studying various physiological states of the organism, and for investigating the effects of drugs are demonstrated. The possibilities and usefulness of simultaneous registration of the EEG amplitude and other physiological parameters are described.

3223. The ultrasonic motion detector: a conditioned stimulus for rats in the CER paradigm - Cunningham C.L. - Univ. Oregon Med. Sch., Portland, Ore. 97201 - BULL.PSYCHONOMIC SOC 1974 4/4B (441-444)

In an attempt to resolve conflicting data concerning the conditioned stimulus (CS) properties of the 40 kHz signal generated by the

ultrasonic motion detector, the high frequency signal (96 to 112 dB) was used as the CS in a conditioned emotional response (CER) experiment. Rats receiving forward pairings of the tone with shock showed progressive decreases in activity in the presence of the tone, as compared with controls, during off the baseline conditioning sessions. During the CER test session, the forward pairings groups showed reliably more suppression to the high frequency CS. It was concluded that the ultrasonic motion detector can mediate associative response tendencies.

3224. Delayed signal EEG trigger - Gergely S. and Paul R. - Dept. Electr. Engin., Lanchester Polytechn., Coventry - BIO-MED.ENGINEERING (Lond.) 1975 10/3 (105-107)

Long EEG recordings are often necessary to capture the signals in the short period just before an epileptic attack. This procedure has many disadvantages. The equipment described below enables only the signals of interest to be recorded. It is designed to operate in conjunction with a commercial electroencephalograph and consists of a signal store with a programmable series of logic gates for sensing the onset of an epileptic discharge and activating the chart recorder. The particular system described has a signal bandwidth of d.c. to 25 Hz in all 16 channels, and, because of their particular clinical diagnostic importance, all signals for the 20 sec immediately preceding the discharge are recorded. The recording can take place for up to one hour after the attack and, if a second attack should occur, it can also be recorded similarly to the first one.

3225. Biofeedback apparatus: list of suppliers - Rugh J.D. and Schwitzgebel R.L. - Claremont Grad. Sch., Claremont, Calif. - BEHAV.THER. 1975 6/2 (238-240)

The popularity of biofeedback procedures has resulted in a wide variety of commercial products. This report lists 38 suppliers, the types of feedback devices available, and retail prices.

3226. Measurement of EEG time relationships - Hicks R.G. - Psychol. Dept., Univ. West. Australia, Nedlands - ELECTROENCEPH.CLIN.NEUROPHYSIOL 1975 38/5 (530-532)

A real time method of obtaining consecutive phase relationships between two cortical areas (EEG) is described. Phase detection is unaffected by amplitude fluctuations. A simple method of an interpolated servo unit indicates which of the two cortical areas is leading. Added circuits provide the degree of phase angular displacement for each waveform. The circuit is simple and inexpensive to build.

3227. Some comments on the use of Wiener filtering for the estimation of evoked potentials - Doyle D.J. - Dept. Electr. Engin., Univ. British Columbia, Vancouver -

ELECTROENCEPH.CLIN.NEUROPHYSIOL. 1975 38/5 (533-534)

It is shown that a previous formulation of the Wiener filter for use in the estimation of evoked potentials (Walter 1969) is incorrect. The origin of anomalies thereby produced is discussed.

3228. Remote measurement of fluid volume by X ray fluorescence - Hermann G.L. and Kiker W.E. - Phys. Sci. Dept., Armed Forces Radiobiol. Res. Inst., Bethesda, Md. 20014 - MED.PHYS. 1975 2/1 (20-21)

A technique utilizing X ray fluorescence has been used to measure remotely the volume and, thereby, the hydrostatic pressure of a cesium nitrate solution in vitro. The excitation radiation source was ^{99}mTc , and the X ray spectra were measured with a sodium iodide spectrometry system. This technique may be applicable to long term in vivo measurements of intracranial pressure for conditions such as hydrocephalus.

3229. On the phase sensitivity of neurons of the cat's auditory system - Kotelenko L.M. and Radionova E.A. - I.P. Pavlov Inst. Physiol., Acad. Scis USSR, Leningrad - JACOUST.SOCAMER. 1975 57/4 (979-982)

It was established that neurons from the cochlear nucleus and inferior colliculus show in a great majority of cases a pronounced reaction to the phase shift of 1 of the components in a 2 tone complex signal. Diminution or augmentation of both the phasic and tonic discharge patterns may take place with the phase shift. The interrelation between frequencies and intensities of the components forming the complex signal are of importance for phase effects. There is a certain connection between the phase sensitivity of a neuron and inhibitory phenomena in its activity. The response area seems to show no correlation with the neuron phase sensitivity.

3230. Exploring the speed of mental processes - Mathews M.V., Meyer D.E. and Sternberg S. - Bell Labs, Murray Hill, N.J. - BELL LAB.REC. 1975 53/3 (148-156)

A new way to study human memory, pioneered at Bell Labs, is yielding insights about basic mental processes by measuring how much time people take to retrieve information stored in the brain.

6.12. Receptors

3231. New selection of hearing aids (Swedish) - Fagerberg G. - INFORM.REHAB. 1974 29/2 (2-5)

In March 1974 the Swedish Social Services Department approved a new selection of hearing aids eligible for grants. Ear specialists can now choose between 39 different hearing aids for the hard of hearing. Half of the aids were not in the earlier selection. The new aids and the basis for the choice are described.

3232. The response of the rabbit eye to laser irradiation of the iris - Unger W.G., Perkins E.S. and Bass M.S. - Dept. Exp. Ophthalmol., Inst. Ophthalmol., London - EXP.EYE RES. 1974 19/4 (367-377)

Irradiation of the pigmented rabbit iris with a ruby laser induces a transient rise of intraocular pressure, pupil constriction and a breakdown of the blood aqueous barrier. Aqueous withdrawn during the peak response contained

notable amounts of E type prostaglandins. Pretreatment with indomethacin prevented prostaglandin formation and reduced the ocular changes. Intravenous injection of a carbon suspension or fluorescein afforded evidence that the increased permeability to plasma protein occurs in the ciliary processes and not in the iris.

3233. Precise recording of human eye movements

- Collewijn H., Van Der Mark F. and Jansen T.C. - Dept. Physiol., Fac. Med., Erasmus Univ., Rotterdam - VISION RES. 1975 15/3 (447-450)

The precise recording of human eye movements is often of high interest in fundamental and clinical investigations of the oculomotor and visual systems. An induction coil was mounted on a scleral contact lens. Around the head, an a.c. magnetic field was generated. Due to the transformer effect, an a.c. potential was induced in the ocular coil, with a magnitude and phase related in a simple manner to angular eye position. One drawback of this method, which is unsurpassed in quality and flexibility otherwise, is the need for the subject to wear a scleral contact lens held to the eye by suction. Such lenses, if not individually fitted, cause some bulging of the cornea and are rather uncomfortable. Slipping is hard to control and aggravated by the forces exerted by the lids on the suction tube. Though these and some other sources of annoyance (such as breakage of the electrical leads) do not seem unsurmountable they may have hampered a more general use of the method until now. To surpass this problem a special carrier has been developed: a flexible ring, which fits on the limbic area, concentric with the cornea.

3234. Studies on dynamic changes of crystalline lens due to accommodation. Report I. The principle of a new recording device (Japanese)

- Manabe T. - Dept. Ophthalmol., Tokyo Med. Dent. Univ. Sch. Med., Tokyo - ACTA SOC.OPTHAL.JAP. 1974 78/11 (1213-1217)

Accommodation in itself has a dynamic nature. The changes in the crystalline lens are one of the most important factors in ascertaining the dynamic nature of accommodation. Therefore, it is necessary to record continuously the changes occurring in the lens during accommodation. New equipment was devised which consisted of an A mode ultrasonic apparatus and recording system. Using this device, the changes in the anterior chamber depth and in the lens thickness of the subject's eye looking at the target between the far and near point of accommodation were automatically and continuously measured. The principle of this recording device and some experimental data are discussed. (15 references)

3235. Measuring in the ear gain of hearing aids by the acoustic reflex method - Tonisson W. - Nat. Acoust. Lab., Millers Point - J.SPEECH.HEARING RES. 1975 18/1 (17-30)

The gain of hearing aids is conventionally measured in a hard walled 2 ml coupler. It has become increasingly apparent, however, that many interacting variables can affect the aid's behavior in an individual ear quite significantly.

Therefore it is desirable that any departure from coupler response be known. A number of methods have been used to measure real ear gain, some of which require expensive or nonstandard instrumentation. An alternative method is described, based on measurements of aided and unaided acoustic reflex thresholds that appears to have certain advantages over other methods. When the aid was coupled to the open ear, average real ear response was down at all frequencies relative to the 2 ml coupler, although relative to the closed ear response frequencies above 1.6 k Hz were emphasized. It is argued that real ear response can be expected to vary considerably depending on the location and orientation of the microphone of the aid on the head or body. It is suggested therefore that real ear measurements be part of every aid selection procedure, especially for persons with a reduced dynamic range. Response modifications might then be possible to enable the critical speech frequencies to be heard at a comfortable level.

3236. Pursuit auditory tracking of dichotically presented tonal amplitudes - Sussman H.M., MacNeilage P.F. and Lumbley J.L. - Univ. Texas, Austin, Tex. - J.SPEECH.HEARING RES. 1975 18/1 (74-81)

In pursuit auditory tracking tasks subjects match a continuously varying pure tone presented to one ear with a second tone presented to the other ear and controlled by unidimensional movements of part of their motor system. In previous studies in which tonal frequency was varied, performance was significantly better when the tone controlled by a speech articulator (tongue, jaw) was presented to the right ear, rather than the left, but not if the tone was hand controlled. In this study tonal amplitude was varied in mandibular and manual tracking by 30 normal right handed subjects. Small right ear advantage was found for tracking modes although it did not reach statistical significance. Frequency modulated stimuli may more effectively differentiate speech from nonspeech tracking because one may, as a result of speech experience, possess a more developed lateralized auditory sensorimotor algorithm for frequency motor relationships involving the mandible than for amplitude motor relationships. Testable consequences of this hypothesis are outlined.

3237. Some statistical characteristics of voice fundamental frequency - Horii Y. - Purdue Univ., West Lafayette, Ind. - J.SPEECH.HEARING RES. 1975 18/1 (192-201)

Two experiments are reported in which the magnitude of sampling errors associated with estimates of the mean, median, and standard deviation of voice fundamental frequencies (f_0) during oral reading is investigated as a function of sample size. In one experiment, voices are sampled with fixed time windows. In the other experiment, results of f_0 analysis are compared for single sentence voice samples and paragraph voice samples. Overall shape of f_0 distributions as well as interrelationships among various distributional measures are discussed.

3238. Characteristics of the RF sound transducer - Eichert E.S. and Frey A.H. - Randomline, Inc.,

County Line Mann Roads, Huntingdon Valley, Pa. 19006 - BIOPHYSJ. 1975 15/2II (272A)

Appropriately pulse modulated UHF electromagnetic energy is perceived as sound by humans. This phenomenon, called rf sound, can be used as a tool to investigate the auditory system. A psychophysical experiment designed to provide information on the characteristics of the rf sound transducer is reported. Humans were illuminated with pulse pair modulated 1.254 GHz electromagnetic energy. It was found that the periodicity pitch phenomenon is not a characteristic of rf sound. Pairs of rf pulses are perceived as equivalent to a 5 ± 1.6 kHz audio signal and the rf sound transducer may require at least 2 ms and possibly 3 ms for full recovery. These results are related to other rf sound characteristics, such as lack of cochlear microphonics, and the implications are discussed.

3239. Localization of a pH sensitive site of metarhodopsin - Lisman J., Sheline Y. and Brown P.K. - Biol. Lab., Harvard Univ., Cambridge, Mass. 02138 - BIOPHYSJ. 1975 15/2II (172A)

The authors found that the metarhodopsin of Limulus ventral photoreceptors is an acid base indicator whose pH sensitive site is on the outside of the membrane. Intracellular recordings of the early potential show that at outside pH (pH_o) 7.8, light converts rhodopsin (λ_{max}) 530 nm to a stable photoproduct (acid metarhodopsin) with λ_{max} close to that of rhodopsin. At pH_o 9.6, λ_{max} of the photoproduct (alkaline metarhodopsin) is much shorter (below 430 nm). The effect of changing pH_o is rapid (1 min). The following experiments suggest that these changes in λ_{max} depend on changes in the extracellular pH rather than on the pH inside the cell [pH(i)]: injection of pH 10 glycine buffer into the cytoplasm (final concentration > 100 mM) does not convert acid metarhodopsin to alkaline metarhodopsin; intracellular injection of pH 7 buffer (HEPES > 100 mM) does not block the effect that raising external pH has on metarhodopsin; pH(i) was determined by injecting the pH indicator, phenol red, into the cell and measuring its color in the microspectrophotometer. Raising pH from 7.8 to 9.6 causes little change in pH(i) (< 0.4 pH units).

3240. The directly recorded standing potential of the human eye - Skoog K.O. - Dept. Ophthalmol., Univ. Linkoping - ACTA OPHTHAL. (Kbh.) 1975 53/2 (120-132)

By means of a newly developed method including a suction contact lens and matched calomel half cell electrodes which were temperature stabilized, the standing potential (SP) of the human eye, considered to be generated mainly in the pigment epithelium, could be directly recorded under stable conditions. Upon a change in illumination from darkness to 16 Lux, an initial, rather fast, negative transient was followed by slower, damped oscillations with a frequency of about 2/hr. The maximum amplitude of an oscillation was of the order of 5 mV. When the illumination was changed in the opposite direction, the polarity of the oscillations was reversed into a mirror image of the variations described above. Also, the oscillations now were

considerably smaller in amplitude. With respect to phases and frequencies, the results correspond well to the changes found in electrooculogram measurements. The new method seems to permit a study of the effects of drugs and other substances on the human SP, which is also likely to reflect the condition of the pigment epithelium.

3241. Where lies the boundary between common sensation and taste perception in electrogustometry - WO LIEGT DIE GRENZE ZWISCHEN SENSIBLER UND GUSTATORISCHER WAHRNEHMUNG IN DER ELEKTROGUSTOMETRIE - Kida A. and Rollin H. - Univ. HNO Klin., Hamburg - H.N.O. (Berl.) 1975 23/3 (72-73)

The shift of the electrogustatory threshold following section of the *corda tympani* has been investigated in 14 patients. Postoperatively the anterior half of one side of the tongue showed complete ageusia. Two thirds of the patients were able to recognise stimulations of 50 to 127 μ A as a burning, and not a sour metallic, sensation for at least 1 to 2 weeks. Probably the trigeminal nerve endings perceive this burning sensation during the period of taste bud degeneration. A similar situation exists in cases where the gustatory fibers are interrupted proximal to the gustatory ganglion, because the taste buds do not degenerate. It is therefore important to ask the patient to describe the sensation experienced. Only a sour metallic taste during electrogustometry should be regarded as a true gustatory sensation.

3242. Linear polarizing filters and underwater vision - Luria S.M. and Kinney J.A.S. - Nav. Submar. Med. Res. Lab., Groton, Conn. 06340 - UNDERSEA BIOMED. RES. 1974 1/4 (371-378)

The effectiveness of linear polarizing filters in improving resolution acuity and detection thresholds under water was measured both in sunlight and under polarized artificial light. The magnitude of natural polarization of sunlight is enough to affect the thresholds as the observer's polarizing filter is rotated, but vision with the filter is not reliably superior to that without the filter. In dimmer artificial light, the reduction in the amount of light reaching the eye through the filter outweighs any beneficial effects of the polarization phenomenon and visibility is decreased.

3243. An automatic objective optometer: description and clinical evaluation - Polse K.A. and Kerr K.E. - Sch. Optom., Univ. California, Berkeley, Calif. - ARCH.OPTHAL. 1975 93/3 (225-231)

Automatic objective optometers provide a possible alternative to conventional clinical methods of refracting the human eye. Quantitative evaluation of one of these instruments (Dioptron), including a comparison between optometer and subjective refractions, was undertaken to determine how automatic optometers may be utilized most effectively in clinical situations. The results showed a high degree of instrument validity and reliability. The conclusion is that the Dioptron has substantial promise as a means of estimating ametropia as a replacement for retinoscopy and for screening or monitoring ametropia. However, the use of this instrument as a substitute for subjective

refraction procedures does not seem warranted at this time.

3244. Scaling loudness, noisiness, and annoyance of aircraft noise - Berglund B., Berglund U. and Lindvall T. - Psychol. Labs, Univ. Stockholm - JACOUST.SOCAMER. 1975 57/4 (930-934)

The capacity of man to differentiate and scale aircraft noise with regard to three psychological attributes frequently encountered in social survey research on ambient noise was tested. Calibrated scales for the attributes evolved from the two step psychological scaling procedure employed. It was demonstrated that observers in carefully designed laboratory situations are able to use and produce scales of loudness, noisiness, and annoyance for aircraft noise. The relationships between the attributes were satisfactorily described by linear functions. In general, aircraft noise was judged to be more annoying than noisy and more noisy than loud. For all three attributes, the psychophysical relationships were best described by power functions with dBA(max) as the physical measure.

3245. Assessment of hearing handicap: comment on the Kryter series - Noble W.G. - Univ. New England, Armidale - JACOUST.SOCAMER. 1975 57/3 (750-752)

The assessment of hearing handicap resulting from exposure to noise has been extensively discussed by Kryter and by subsequent commentators. It is argued that many problems and relevant findings on this issue have been overlooked in that series. It is further argued that a measure based on self report holds more promise for the valid assessment of hearing handicap resulting from noise induced hearing loss than performance tests of auditory pure tone sensitivity or speech reception.

3246. On optical crosstalk between fly rhabdomeres - Wijngaard W. and Stavenga D.G. - Dept. Med. Physiol. Phys., Rijks Univ., Utrecht - BIOL.CYBERN. 1975 18/2 (61-67)

In a fly retina light may be transferred among the rhabdomeres. It is estimated that the light from a point source imaged on the axis of a rhabdomere may eventually be transferred completely to a neighbouring rhabdomere. However, the effect on the sensitivity of this latter rhabdomere will remain small, owing to the fact that the light transfer occurs only proximally. This result is in accordance with the neural superposition theory of fly vision.

3247. A theory of the pattern induced flight orientation of the fly *Musca domestica* II - Reichardt W. and Poggio T. - Max Planck Inst. Biol. Kybernet., Tubingen - BIOL.CYBERN. 1975 18/2 (69-80)

In a preceding paper, Poggio and Reichardt (1973), a phenomenologic theory describing the visual orientation behaviour of fixed flying flies (*Musca domestica*) towards elementary patterns was presented. Some of the problems raised in this first paper are treated here in more detail. The mapping between the position dependent torque distribution, D(ψ) characteristics, associated with a given pattern and the

stationary orientation distribution $p(\psi)$ is studied taking into account that the fluctuation process (generated by the fly) is coloured gaussian noise. Under certain critical conditions this may lead to an 'early symmetry breaking' in the mean values of the $p(\psi)$ distribution. The validity of the 'superposition principle' has also been examined. Although shift and superposition give the main qualitative features of the 'attractiveness profile' $D(\psi)$ associated with a 2 stripe pattern, superposition does not hold quantitatively for stripe separations up to about 80°. Evidence is presented suggesting that such an effect is due to inhibitory interactions between input channels of the fly's eye. Implications of this finding with respect to the problem of spontaneous pattern preference are also discussed.

3248. Simplified recording

microspectrophotometer - Casella A.J., Strother G.K. and Connolly J.W. - Dept. Phys., Pennsylvania State Univ., University Park, Pa. 16802 - APPLOPT. 1975 14/3 (771-777)

Most of the recording

microspectrophotometers described to date are laboratory built instruments utilizing a carefully designed optical train and dynode feedback to the photomultiplier tube. A simplified recording microspectrophotometer which has been designed to eliminate the above 2 requirements is reported. In addition, improvements in electronic circuitry due to the use of solid state operational amplifiers are described. A capability for use in visual pigment studies is demonstrated.

6.13. Locomotor apparatus

3249. Traffic milieu adapted to the handicapped: demand by Scandinavian congress (Swedish) -

Ljunggren E. - INFORM.REHAB. 1974 29/4 (6-8)

A call to adapt the traffic environment, particularly pedestrian traffic, to the needs of the handicapped was made by a rehabilitation congress in Stockholm. This initiative requires international cooperation.

3250. Lions prize goes to a bath seat (Swedish) -

INFORMREHAB. 1974 29/4 (19)

A prize winning design for a bath seat for the handicapped child is described. It comprises a seat unit with side supports, a leg divider and a harnessing device. A wide ring is attached to the side supports in order to keep toys etc within the child's reach. The chair is equipped with suction pads for secure fastening to the bottom of the bath.

3251. Physiological aspects of synthetic tracks. Foot motions during support phase of various running types on different track materials -

Haberl R. and Prokop L. - Osterreich. Inst. Sportmed, Wien - BIOTELEMETRY 1974 1/3 (171-178)

The elements musculus triceps surae, tendo calcaneus, foot and synthetic track are considered to be parts of a mechanical oscillating system. The applicability of this method is tested by measurement of the vertical acceleration component of the foot mass by a one channel

biotelemetry system, during various motion cycles. The initial statement was provable by this method. Dependence of the oscillating frequency and amplitude on step length and step frequency, on the mass of the athlete and his feet and especially on the considered track material and its physical qualities was also provable. Description of the important parameters of the 'Tartan syndrome' and a method to avoid it generally are given.

3252. Fracture due to shock from domestic electricity supply - O'Flanagan P.H. - Derbyshire Roy. Infirmary, Derby - INJURY 1975 6/3 (244-245)

A fracture dislocation of the shoulder joint due to electric shock is described. This is the first case reported in an English language journal of fracture due to shock from the domestic electricity supply. Other cases have been reported but not caused by such a low voltage current.

3253. Electromyographic investigations of the motor units in the deltoid muscle of the dog -

Kozarov D., Gydkov A. and Raditcheva N. - Inst. Physiol., Bulg. Acad. Sci., Sofia - BIOPHYSICS (Oxford) 1974 19/1 (174-181)

The authors studied the myopotentials of the individual motor units (MU) in the deltoid muscle of the dog and in particular the value of the distance between the MU and the recording electrodes and the distance between the zone of the motor plates and the electrodes. The extraterritorial field of the potentials of the active MU in the deltoid muscle of the dog is described. This field is compared with the field of active MU in the human muscles. It is concluded that the MU in the muscles of dogs are organized territorially similar to the MU in man.

3254. Biomechanical and biochemical changes in the periarticular connective tissue during contracture development in the immobilized rabbit knee - Akeson W.H., Woo S.L.Y., Amiel D. and Matthews J.V. - Div. Orthop. Rehab., Univ. California, San Diego/La Jolla, Calif. 92037 - CONNECTTISSUE RES. 1974 2/4 (315-323)

The progressive rabbit knee joint stiffening resulting from immobilization was studied using biomechanical and biochemical methods. Consistent trends of increase in joint stiffness and decrease in water and total hexosamine content in the periarticular connective tissue were seen as the time of immobilization increased. In addition, positive correlations were found between the total hexosamine loss and the biomechanical measurements in the contracture joints. The correlations demonstrated support of the hypothesis of periarticular connective tissue homeostasis. A cycle of events in which physiological joint forces and motion stimulate fibroblasts to synthesize proteoglycans, which in turn lubricate the collagen fiber interface and allow joints to move easily, is postulated and discussed. These biomechanical and biochemical data, which also detail the rate of contracture development, will provide the requisite basal values in the evaluation of prevention and treatment of experimental contractures by therapeutic agents.

3255. Impulse interference in the summated electromyogram - Gydikov A. and Tankov N. - Inst. Physiol., Bulgar. Acad. Sci., Sofia - ACTA PHYSIOL PHARMACOL BULG. 1974 vol. 2 (18-27)

A study was made of the interference of impulses with different shapes by recording the summated electromyogram (EMG) using different surface electrodes. A dependence was established of the mean voltage of the summated EMG and the number of oscillations per unit time in the summated EMG on the level of muscle tension upon recordings with different electrodes. It was shown that both the mean voltage curve of the summated EMG and the number of impulses per unit time in the summated EMG depend on the type of electrodes used and, consequently, on the shapes of the interfering impulses. The number and the amplitudes of the positive phases of the impulses from the different motor units are of importance for the mean voltage curve of the EMG, while the number of impulses per unit time in the summated EMG depends on the number of the extrema, on the effort used, and on whether the summing impulses are of one or of different types.

3256. A new fixation device for supracondylar and low femoral shaft fractures - Shelton M.L., Grantham S.A., Neer C.S. II and Singh R. - Harlem Hosp. Cent., New York, N.Y. 10037 - J. TRAUMA 1974 14/10 (821-835)

The results in 14 cases indicate that for selected supracondylar and lower femoral shaft fractures, superior results may be obtained by open reduction and internal fixation using a new plate. Advantages of this method are: a small amount of equipment is required; the plate is very strong; the plate is essentially selfreducing with regards to rotation and varus valgus alignment; and the device facilitates good condylar fixation, which has been difficult to achieve by other techniques. The lateral approach, reflecting the vastus lateralis and the patellar pouch medially, follows anatomic planes, avoids disrupting the quadriceps mechanism, minimized scarring, and allows early range of motion exercises with rapid return of quadriceps muscle power. This preliminary series suggests that surgeons can now reliably restore anatomy, maintain stability, obtain adequate range of knee motion, and shorten the overall hospital stay for selected patients with supracondylar and distal femoral fractures.

3257. Accretion and resorption of bone: experimental approaches - Mills B.G. - Univ. South. California Sch. Dent., Los Angeles, Calif. 90007 - BIOMAT MED DEV ARTIF ORGANS. 1974 2/2 (119-146)

When prostheses and artificial devices fail in situ, the failure can often be attributed to an unfavorable response of the supporting tissue. Bone provides the foundation in many instances. The strength or weakness of living bone is under the control of its cells. Knowledge of the responses of these cells is necessary to predict modifications in design required to produce the proper kind and amount of stress which will result in maintenance of bone rather than its resorption. A review is given of experimental

approaches which have yielded important information about bone as a material and about its physiology, both normal and abnormal. At present the methods of producing new bone are very limited. These include the use of 10-20 μ A of direct current applied to bone at the cathode of implanted electrodes or the administration of oral fluorides which produce bone of poor quality. Prevention of bone resorption is thus of utmost importance. The proper kind and amount of stress as well as the proper hormone balance is necessary to maintain bone. Good oral hygiene and use of fluoridated water help prevent alveolar bone loss.

3258. A simple force platform - Bonde Petersen F. - Lab. Theory Gymnast, August Krogh Inst., Univ. Copenhagen - EUR J APPL PHYSIOL 1975 34/1 (51-54)

The force platform consists of a sandwich of steel, Rockwood and concrete plates about 900 x 700 mm in surface. 4 Steel rings were bolted to the under side of the steel plate in each corner. Each steel ring was furnished with only one strain gauge, 2 of which were placed on the outer, and 2 on the inner side of each ring. The 4 strain gauges were connected to a measuring bridge. Before mounting the rings on the steel plate, the sensitivity to pressure of each ring was adjusted in such a way that they were all similar. Because of this, the platform responded with a signal which was independent of where a pressure was applied on the surface of the platform. The platform showed a rectilinear response for static forces up to 500 kp, with a stable zero value. In response to dynamic forces the platform showed a resonance frequency of about 50 Hz, with a damping factor of 0.15. Calibration of dynamic forces was carried out by calculation of the forces during a vertical jump compared with what would be expected from the time of flight also registered by the platform measuring bridge ink writer setup. The time of flight was significantly higher (11%) than was expected from the time force relations before takeoff. This was explained partly by the relatively low damping factor in the system, partly by the subjects not extending their knees at landing on the platform.

3259. Contractile repriming of frog denervated single muscle fibers - Stuesse S.C. and Lindley B.D. - Dept. Physiol., Sch. Med., Case West. Reserve Univ., Cleveland, Ohio 44106 - BIOPHYS J. 1975 15/2II (150A)

Following conditioning maximal K^+ contractures of isolated single muscle fibers from *Rana pipiens*, a brief recovery period is required to restore the ability to produce maximal tension in response to subsequent test depolarization. At 2.5 mM K^+ , there is a lag time of 5 sec before any tension can be produced, and recovery is half complete at 13 sec. The time for half recovery is increased by decreasing external $[Ca^{++}]$ and is proportional to the square of the fiber radius. The steady state of recovery depends on the $[K^+]$ during the recovery interval (Na free tris methanesulfonate solutions). There was no significant difference in rate of repriming between normal fibers and fibers which had been

denervated for periods of up to 8 wk.

3260. A study of force length relations in normal and stretched glycerinated rabbit psoas muscle - Tyler Burt C. - Dept. Biol. Chem., Univ. Illinois, Med. Cent., Chicago, Ill. 60612 - BIOPHYS.J. 1975 15/2II (150A)

The force length curves (total, passive and active) were examined for both stretched (15 and 30%) and unstretched glycerinated rabbit psoas fibers. The curves were determined for a series of muscles released from one isometric state to another while continuously immersed in contracting solution, i.e., uncycled except for the initial stretches. It was found that unstretched curves behave exactly as do curves for live muscle in that they have almost the same modulus on extension as during shortening. Stretched muscles, however, confirm the results of Edman that the active force in the realm of relative lengths greater than 1.0 is not a linear function with a negative slope and intercept equal to the point of zero overlap. Rather, the force is nearly constant when the passive force is subtracted. In addition, the initial isometric force is almost constant. This is what one would expect from a stable collection of sarcomeres each of which obeys a conventional force length curve. This situation is then contrasted with live muscle preparations.

3261. Fluorescence changes associated with Donnan potential changes in the thick filaments of muscle - Scordilis S.P. - Dept. Biol. Sci., State Univ. New York, Albany, N.Y. 12222 - BIOPHYS.J. 1975 15/2II (155A)

The fluorescence of the electrofluorochrome CC 6 (3, 3' dihexyl 2, 2' oxacarboxyanine) in the presence of rabbit striated muscle myofibrils was shown to change linearly with the magnitude of the presumed Donnan potential of glycerol extracted rabbit striated muscle. Experiments were performed with synthetic thin filaments (polymerized G actin (TNF)) and synthetic thick filaments (polymerized myosin (TKF)), to determine how much of the fluorescence change found in myofibrils is due to these proteins. Addition of salt to the synthetic filaments, which should decrease the Donnan potential, decreased the fluorescence of CC 6 with TKF, but not with TNF. The addition of MgATP significantly decreased the fluorescence of CC 6 with TKF. Previously, a similar decrease was found with myofibrils. No such change was seen with TNF. The fluorescence changes of CC 6 with the combination of TKF and TNF were identical to those of the TKF alone. Therefore, the changes in fluorescence and presumably the changes in the Donnan potential occur only in the thick filaments and are independent of the presence of actin.

3262. ATP in retinal rods - Robinson W.E., Yoshikami S. and Hagins W.A. - NIH, Bethesda, Md. 20014 - BIOPHYS.J. 1975 15/2II (168A)

Suspensions of freshly isolated frog rod outer segments (r.o.s.) were assayed for adenosine triphosphate (ATP) in a continuous stream analyzer by the firefly Luciferin Luciferase (LL) method. Washed, fresh r.o.s. cause little light

emission on mixing with LL. If previously exposed to Triton X 100, ground in an ultra sonic mill, or freeze thawed, ATP is readily detected. The ATP concentration in a sonicated stream containing r.o.s. shows fluctuations consistent with the number of ATP bearing particles being equal to the number of o.s. with intact plasma membranes (Yoshikami et al). The ATP concentration in fresh o.s. cytoplasm ranges from 2 to 5 mM. In darkness, the detectable ATP declines to 50% of its initial value in about 30 min at 25°C. Total bleaching of the o.s. causes about a 10% fall in detectable ATP that is complete within less than 10 sec. Partial bleaching produces a smaller effect. After a bleach, the remaining ATP slowly disappears at about the same rate as before. The ATP concentration is no longer affected by light after a total bleach. Although the light induced ATP loss is equivalent to less than 20% of the rhodopsin in outer segments, other nucleotide triphosphates are present. These may buffer the ATP level via kinases and thus the true level of PO_4 metabolism may be underestimated. ATP utilization may indeed be a direct part of the excitatory mechanism in retinal rods.

3263. A system for defining position and motion of the human body parts - White A.A. III, Panjabi M.M. and Brand R.A. Jr. - Engin. Lab. Musculoskeletal Dis., Sect. Orthop. Surg., Yale Univ. Sch. Med., New Haven, Conn. - MED.BIOENGINEERING 1975 13/2 (261-265)

A system is suggested for the definition of position and motion of the human body parts. Suitable system locations and orientations are described and examples of the use of the system are demonstrated and its advantages pointed out.

6.14. Skin

3264. Stimulation of wound healing with laser beam in the rat - Kovacs I.B., Mester E. and Gorog P. - Otto Korvin Hosp., Budapest - EXPERIENTIA (Basel) 1974 30/11 (1275-1276)

The laser effect on the tensile strength of cut skin wounds closed with clips was tested on rats. Daily repeated irradiation with helium neon gas laser resulted in a considerable increase of tensile strength.

3265. Correction factors in skin temperature measurement - Jirak Z., Jokl M., Stverak J. et al. - Reg. Hyg. Stat., Ostrava - JAPPL.PHYSIOL. 1975 38/4 (752-756)

In 14 persons the skin temperature has been measured by means of thermistor thermometer. The influence of the shape of the probe and the pressure exerted on the resulting value of the skin temperature has been proved. In 10 additional men the relation of the temperature difference (ΔT) to the exerted pressure (P) was determined, the regression equations were derived for relation $\Delta T/P$, and the correlation coefficients for recalculation of the temperatures measured by thermistor thermometer with the pressure exerted 20 g to values determined by thermovision. The skin

temperature values determined by thermography were used in 24 formulas (3-16 points) for calculation of mean skin temperature. The differences of the means in determining the optimal method (16 points) were evaluated by the t test and by the percentage expression of agreement for criteria ± 0.1 , ± 0.2 , ± 0.5 , and $\pm 1.0^\circ\text{C}$. For precise laboratory work 10 points of measurement are recommended; for measurement in the field 6 points of measurement are enough. Orientational measurement can be performed very well by means of the Ramanathan method (4 points).

6.15. Aerospace medicine

3266. Preliminary results of examinations of rats after a 22 day flight aboard the Cosmos 605 biosatellite - Ilyin E.A., Serova L.V., Portugalov V.V. et al. - Inst. Biomed. Problems, USSR Min. Hlth, Moscow - AVIAT. SPACE ENVIRON.MED. 1975 46/3 (319-321)

The results of biomedical investigations carried out in flights of the Salyut and Skylab orbital stations give evidence that during prolonged weightlessness cosmonauts and astronauts remain in a good physical and mental condition. In order to make reliable plans for more such missions, it is necessary to accumulate detailed knowledge about the mechanism of the effect of weightlessness on different functions of the human body. In addition to manned experiments, animal experiments are of great interest. They may yield data that cannot be obtained in human studies, which is obviously very important from the point of view of space medicine. This was the purpose of the experiment carried out in November 1973 on the biosatellite Cosmos 605; 45 rats aboard the biosatellite flew for 22 days. Preliminary results of examinations of rats after this demonstrated not only physiological and biochemical but also morphological changes in their bodies due to prolonged weightlessness. These changes were reversible.

3267. The effects of cosmic particle radiation on pocket mice aboard Apollo XVII: IV. Engineering aspects of the experiment and results of animal tests - Look B.C., Tremor J.W., Barrows W.F. et al. - NASA Ames Res. Cent., Moffett Field, Calif. 94035 - AVIAT. SPACE ENVIRON.MED. 1975 46/4II (500-513)

A closed passive system independent of support from the spacecraft or its crew was developed to house five pocket mice for their flight on Apollo XVII. The reaction of potassium superoxide with carbon dioxide and water vapor to produce oxygen provided a habitable atmosphere within the experiment package. The performance of the system and the ability of the mice to survive the key preflight tests gave reasonable assurance that the mice would also withstand the Apollo flight.

3268. The effects of cosmic particle radiation on pocket mice aboard Apollo XVII: V. Preflight studies on tolerance of pocket mice to oxygen

and heat. Part I. Physiological studies - Leon H.A., Suri K., McTigue M. et al. - NASA Ames Res. Cent., Moffett Field, Calif. 94035 - AVIAT. SPACE ENVIRON.MED. 1975 46/4II (514-520)

Tests were carried out on pocket mice to ascertain their tolerance to elevated oxygen pressures alone and to a combination of hyperoxia and heat in excess of that expected during the flight of the mice on Apollo XVII. The mice withstood oxygen partial pressures up to 12 psi at normal room temperature (24°C , 75°F) over a period of 7 days. A few mice previously exposed to increased $\text{P}(\text{O}_2)$ died in the course of exposure to an oxygen pressure of 10 psi or 12 psi (517 mm or 620 mm Hg) for 13 days in ambient heat of 32°C (90°F). Supplemental vitamin E and physiological saline loading given prior to exposure had no apparent protective effect. The overall conclusion was that the pocket mice which were to go on Apollo XVII could readily survive the ambient atmosphere to which they would be exposed.

3269. The effects of cosmic particle radiation on pocket mice aboard Apollo XVII: V. Preflight studies on tolerance of pocket mice to oxygen and heat. Part II. Effects on lungs - Harrison G.A., Corbett R.L. and Klein G. - NASA Ames Res. Cent., Moffett Field, Calif. 94035 - AVIAT. SPACE ENVIRON.MED. 1975 46/4II (520-524)

An electron microscopic examination was carried out on the lungs of 11 pocket mice (*Perognathus longimembris*) that breathed oxygen at 10 psi or 12 psi partial pressure over a period of 7 days, at the end of which time they were decompressed to sea level O_2 pressure, either suddenly or in 30, 60, or 90 min. Vesiculation was noted in the endothelium of the alveolar capillary wall in most of the animals and, occasionally, blebbing. Some mitochondria were swollen in a few of the animals. Alveolar exudate was, in general, sparse. Compared with the lungs of other rodents, the lungs of pocket mice appeared relatively resistant to the toxic effects of oxygen. This conclusion needs, however, to be tempered by the fact that 5% N_2 was used in the tests reported here. Nonetheless, the results suggest that the oxygen pressures anticipated on the flight of Apollo XVII should be well tolerated by the pocket mice.

6.16. Work and sport

3270. Modification of a standard bicycle ergometer for underwater use - Morlock J.F. and Dressendorfer R.H. - Dept. Physiol., Univ. Hawaii Sch. Med., Honolulu, Hawaii 96822 - UNDERSEA BIOMED.DRES. 1974 1/4 (335-342)

With a few simple modifications, the standard Quinton Monark bicycle ergometer can be made suitable for underwater use. Using an ergometer so modified, $\text{V}(\text{O}_2)$ was measured in 6 young men as a function of pedaling frequency (f, rpm). The resulting data fitted to a third order polynomial gave the relationship: $\text{V}(\text{O}_2)$ (liters/min) = $0.274 + 0.002025f - 0.000059f^2 + 0.000008f^3$ with a correlation coefficient (r) of 0.996. The extremely high accuracy of this predictive

equation makes this simple ergometer of practical importance to the investigator interested in physiological responses to underwater exercise. A theoretical discussion on the physical meaning of each of the zero, first, second, and third order terms of pedaling frequency is presented. The discussion and results indicate that it is both theoretically and statistically correct to eliminate the first and second order terms of the above third order polynomial. This results in an equally accurate ($r = 0.996$) equation of the following form: $V(O_2)$ (liters/min) = $0.274 + 0.000008f^3$.

3271. Measuring equipment for longterm monitoring of respiratory volumina and rate of breathing - MESSGERAT ZUR LANGZEITUBERWACHUNG DER ATEMVOLUMINA UND DER ATEMRATE - Appel E. - Neurochir. Univ. Klin., Dusseldorf - ELEKTRONIK 1975 24/3 (80-84)

An evaluation unit was developed for the intensive and longterm monitoring of respiratory physiological parameters. A flow meter supplies the respiratory flow curve of the patient in the form of analog voltage values. This monitoring unit enables the measurement of the respiratory volumina and the rate of breathing. The article includes circuit details on the respiratory trigger, description of the counter for the rate of breathing, the integrator for the respiratory volumina and of a test method. The data are suitable for input into a computer, meaning that trend calculations can be made.

6.17. Radiology

3272. Spatial resolution of gamma camera and effect of scattered radiation (Japanese) - Matumoto M. - Dept. Radiol., Kumamoto Univ. Med. Sch., Kumamoto - NIPPON ACTA RADIOL. 1974 34/4 (229-238)

Potential resolution of the delay line gamma camera (TOSHIBA, GCA (Toshiba) and effect of scattered radiation by absorbing substance on the resolution were studied. The resolution of ^{99m}Tc with a 4000 hole collimator was the best in air. The resolution distances (FWHM) of ^{99m}Tc obtained with the 4000 hole collimator were 8.4 mm on the surface of the collimator and 11.9 mm at the distance of 10 cm between source and collimator in the X direction, and 7.8 mm and 11.6 mm in the Y direction respectively. Similarly, as to ^{203}Hg , the FWHM were 8.2, 13.2, 7.0 and 13.0 mm respectively. The FWHM of ^{198}Au by the use of a 1000 hole collimator at distances of 5, 10 and 20 cm were 14, 18 and 26 mm in the X direction, and 13, 17 and 26 mm in the Y direction. Resolution in the Y direction was better than that in the X direction. When an absorbing substance was placed between the source and collimator face, the resolution fell off from the effect of scattered radiation. The ratios of FWHM in the 5 cm absorber to that in air were 1.15, 1.13, 1.07 and 1.04 for the 40, 30, 20 and 10% photopeak window respectively. (22 references.)

3273. Altering the energy dependence of LiF TLDs by pre irradiation - Mayhugh M.R. and Fullerton G.D. - Dept. Phys. Radiol., Univ.

Wisconsin, Madison, Wis. 53706 - MED.PHYS. 1974 1/5 (275-276)

Energy dependences (thermoluminescent response to 30-130 keV(eff) X rays compared to that from ^{60}Co gammas) were measured for normal LiF dosimeters and for ones which had been sensitized by preirradiation (10^3 - 10^6 R) followed by annealing near 300°C. Unsensitized LiF (Harshaw's TLD 100 and TLD 700) responds slightly higher (5-10%) to the X rays than expected from changes in dose. When LiF is radiation sensitized, the relative response decreases in the 30-135 keV(eff) range as much as 40% for preexposures $\geq 10^5$ R. A commercial dosimeter (Radiation Detection Co. throwaway powder) displays this altered energy dependence because the LiF is preexposed by the manufacturer. To emphasize the major point: Sensitization alters the energy dependence of LiF without any change in atomic number. Possible uses for this effect are discussed.

3274. Rapid 105 mm amphiphotography

LAMPHOTOGRAPHIE 105 MM A CADENCE RAPIDE - Roussel J., Bigard M.A. and Regent D. - Serv. Cent. Radiol., CHU, Nancy Brabois - J.RADIOELECTROL. 1975 56/1 (83-89)

Results obtained with a new 105 mm amphiphotographic camera for filming at high speeds are reported. A rate of 8 films per second is very useful for the study of sphincters and fleeting phenomena. However, the quality of the images, comparable with those of standard films, the rapidity of the examinations, the easy reading of the films, the important reduction in the dose of X Rays delivered and the economy of film, render this technique useful in general radiology. Unfortunately, there is not at present a simple, rapid formula for presentation of the films obtained. Progress will also have to be made in order to facilitate loading of the camera. Rapid resolution of these problems will permit this technique to be more widely used.

3275. Dodger filters in the modulation of X ray beams - LA MODULATION DU FAISCEAU DE RAYONS X INCIDENT PAR LES FILTRES DODGER - Roussel J., Husson F., Bigard M.A. and Regent D. - Serv. Cent. Radiol., CHU, Nancy Brabois - J.RADIOELECTROL. 1975 56/1 (91-96)

Dodger filters represent a very great improvement in the usual technique of modulation of X ray beams. The mobility of the filters permits efficient use in numerous situations encountered in common radiodiagnosis. Original optical methods ensure perfect adaptability of the filters to morphology and density of the structures examined. The shape and structure of the filters prevent formation of artefacts due to interference on the X rays. To an improvement in the quality of the films, may be added reduction in exposure of the examined subjects. This apparatus, easy to operate, may be used more widely in numerous branches of radiodiagnosis, particularly in cerebral and visceral angiography.

3276. X-ray diffraction from micrograms of quartz on filters using a rotating anode - Pollack S.S. - Carnegie Mellon Univ., Pittsburgh, Pa. 15213 -

X ray diffraction data from samples of 20, 60 and 100 μg quartz on polyvinyl chloride membrane filters were collected using a rotating anode X ray source. These data suggest that 17 μg of quartz, or possibly less, could be measured directly on 35 mm diameter filters, without any type of pretreatment.

3277. Magnetism as a future aid for improved contrast effect in radiologic diagnosis -

MAGNETISMUS ALS ZUKUNFTIGE HILFE FÜR VERBESSERTE KONTRASTHILFE BEI DER RONTGENSTRÄHLendiAGNOSE -
Fahlenbrach H. - Nachtigallental 50,
Essen/Margarethenhöhe - MED.MARKT ACTA
MED.-TECHN. 1975 23/2 (39)

In continuation of Israeli and Japanese experiments, the cooperation of Japanese medical practitioners and experts in magnetism led to further considerable progress with magnetizable contrast media for the radiological diagnosis of digestive organs and the bronchi. These contrast media are kept in place by an external magnetic field and thus enable longer and more thorough radiological exploration. Manganese zinc ferrit powder of the chemical formula $\text{MnO}(0.6) \text{ ZnO}(0.4) \text{ Fe}_2\text{O}_3$ with a weight percentage of 10% of barium oxide (BaO) in grain sizes between 0.5 - 1 μm and addition of silica gel or oil emulsion proved according to the test results the most suitable contrast medium. In these tests concerning absorption, toxicity in rats or mice was also investigated and proved an adequate insolubility in artificial gastric and duodenal juice.

3278. A simplified injection technique for shoulder arthrography - Schneider R., Ghelman B. and Kaye J.J. - Dept. Radiol., Hosp. Spec. Surg. New York, N.Y. 10021 - RADIOLOGY 1975 114/3 (738-739)

An easy and reliable technique to inject the shoulder joint for arthrography is described. The technique utilizes a straight anteroposterior position of the patient and a directly vertical placement of the needle with the aid of fluoroscopy.

3279. Three dimensional isodoses for radiotherapy in stereoscopic representation -

DREIDIMENSIONALE ISODOSEN FÜR DIE STRÄHLENTHERAPIE IN STEREOSKOPISCHER DARSTELLUNG - Busch M. - Radiol. Zent., Univ. Marburg/L. - STRÄHLENTHERAPIE 1975 149/2 (155-161)

Three dimensional isodoses can be calculated with the aid of computers, and recorded stereoscopically in a relatively inexpensive manner. A critical judgement is given concerning the clinical practical as well as the instructional value of stereoscopic representations of isodoses.

3280. An instrument for the rapid check of output, energy and field symmetry of supervoltage therapy equipment - Jones D. and Schumacher D. - Northwest Med. Phys. Cent., Univ. Hosp., Univ. Washington, Seattle, Wash. - AMER.J.ROENTGENOL 1975 123/1 (198-202)

Linear accelerators and similar machines which depend on the calibration of a monitor ionization chamber must be suspect as to

accuracy of output calibration and should be checked frequently, preferably at the beginning and end of a treatment session by the therapy technician. Commercially available dosimeters are not particularly well suited to this purpose, being cumbersome to set up and requiring some skill in their operation. An instrument developed to measure the output energy and beam symmetry is described. Seven of these instruments have been produced and are in use at radiation therapy centers in Washington and Oregon. The device has already served its purpose to alert the radiotherapist to a malfunction in his machine on numerous occasions.

3281. A high sensitivity, high resolution, diverging collimator for use with low energy isotopes - Causer D.A. and Taylor C.G. - Dept. Med. Phys., Univ. Aberdeen - PHYS.MED.BIOL. 1975 20/2 (318-320)

The collimator was designed for use with $^{99}\text{Tc}(\text{m})$, and in lung and liver scanning, ample quanta are available so that sensitivity is not crucially important. However the high sensitivity of this collimator allows it to be used for ^{133}Xe ventilation scans. This means that it is possible to perform both a perfusion scan using $^{99}\text{Tc}(\text{m})$ MAA, and a ^{133}Xe ventilation scan on a patient, without changing the collimator.

3282. Contrast of dose distribution in phantom heads due to aperture and plane wave sources - Ho H.S. - DHEW, PHS, Food Drug Adm., Bur. Radiol. Hlth, Rockville, Md. 20852 - ANN.N.Y.ACAD.SCI. 1975 vol. 247 (454-472)

Current microwave biologic effects research uses aperture and plane wave sources. In this theoretic investigation, the dose rate (time rate of energy absorption per unit mass) patterns are compared between phantom heads irradiated by both microwave sources. Two brain tissue equivalent spheres with radii of 3.3 and 7 cm are used to simulate monkey and human heads, respectively. In addition, a five layered tissue equivalent sphere is employed to simulate more closely the various tissues in a monkey head. Theoretic formulations of dose rate patterns in multi layered tissue equivalent spheres due to separate plane wave and aperture source treatments are derived from the summation of spherical harmonics technique. Calculations are made for the dose rate patterns along two cross sectional planes and three rectangular axes in the spheres. The results of these calculations indicate variations in dose rate patterns for different sources and phantom head sizes. For aperture irradiation, microwave energy penetration into the phantom heads appears weak compared to the hot spots prominent in the plane wave exposure situation. It is concluded that for different radiation sources, direct comparison of biologic results by external field measurements as the only common denominator may not be dosimetrically valid. The results also indicate that for the same measured exposure rate (power density), the microwave energy absorption pattern in a human head may vary according to the type of radiation source.

3283. A restraining device for irradiating rats -

Faulkner K.D.B. - Dept. Dent. Prosthet., Univ. Melbourne - AUSTDENTJ. 1975 20/1 (19-21)

The construction and use is described of a holding device, which ensures replication of irradiation procedures for rats, and the location of the animal for maximum ionization in the selected area.

3284. A novel fast neutron dosimeter based on fission chambers. Part I: Principles of operation and theoretical response in neutron therapy radiation fields - Porter D., Lawson R.C. and Hannan W.J. - Dept. Clin. Phys. Bio Engin., West Scotland Hlth Boards, Glasgow - PHYS.MED.BIOL. 1975 20/3 (431-445)

A novel method is proposed of accurately measuring fast neutron doses of interest in radiotherapy. The technique, which utilizes calculated neutron fluence to kerma conversion factors, is based upon the combination of measurements with calibrated neptunium 237 and uranium 238 pulse fission chambers to obtain a response which matches the variation of kerma with neutron energy. The theoretical performance of a practical instrument has been assessed for a variety of neutron spectra to evaluate the spectrum dependence of the dosimeter. The overall systematic uncertainty using the absolute method of determining the neutron dose under charged particle equilibrium conditions is comparable to that encountered with ionization chamber techniques.

3285. Dynamic image production with ultrasound (Dutch) - Somer J.C. - Med. Fys. Inst. TNO, Utrecht - TNED.ELEKTRON.RADIOGENOOTSCH. 1975 40/1-2 (35-40)

The Electroscan is a diagnostic ultrasonic instrument capable of generating instantaneous and continuous images corresponding to cross sections of parts of the body by using a stationary probe. The method is based upon a phased array transducer. This is a transducer consisting of a large number of very small elements, each half a wavelength wide, which can be steered individually. Beam steering is accomplished by exciting the elements sequentially with proper time intervals. When using time intervals between firing the elements, the corresponding wavefronts of the elements form a resulting flat wavefront, according to Huygens' principle. This flat wave front has an angle, which is similar to the normal, depending on the time intervals. These time intervals are controlled by a control voltage. Receiving of the echoes takes place in the reversed way, whereby the difference in arrival time of a wave front impinging obliquely are compensated for by a set of electrically variable delay lines. Both transmission, reception and display are controlled by the same control voltage which makes the system very flexible. As a result pulses can be transmitted in every direction within a sector of 90°. Scanning is performed very rapidly, e.g. 30 scans/sec when 32 different directions are used. The second prototype was capable of visualizing space occupying objects most of all, including brain tumors, hydrocephalus and hematomas and pulsations of all large intracranial arteries.

3286. Possibilities of coherent optical processing for the quantitative evaluation of microradiograms - MOGLICHKEITEN DER KOHARENTE OPTISCHEN VERARBEITUNG ZUR QUANTITATIVEN AUSWERTUNG VON MIKRORADIOGRAMMEN - Reinhardt E.R. - Inst. Phys. Elektron., Univ. Stuttgart - BIOMED.TECHN. 1975 20/2 (53-59)

Coherent optical methods applied to the evaluation of X ray photographs are described. These procedures are spatial. Matched filtering, and the evaluation of spatial frequency spectra are also discussed.

3287. An analytic expression for the gamma ray self absorption in the perpendicular axes configuration - Horowitz Y.S., Mordechai S. and Dubi A. - Dept. Phys., Ben Gurion Univ. Negev, Beersheva - NUCLINSTRUM.METH. 1975 124/1 (313-314)

An analytic expression for the self absorption of gamma rays emitted from a point source on the face of a cylindrical absorber is constructed. The symmetry axis of the cylindrical absorber makes an angle of 90° with the symmetry axis of the cylindrical detector.

3288. Computer processing of scintillation camera images - Inouye T. - Toshiba Res. Developm. Cent., Tokyo Shibaura Electric Co., Ltd., Kawasaki - NUCLINSTRUM.METH. 1975 124/1 (215-219)

A rapid computer method for processing images obtained by scintillation camera for medical diagnosis is described. The main features of the processing methods are the data smoothing technique by applying non linear filtering and image resolution improvement using a non damping filter function in the frequency domain.

3289. Ion induced X ray spectroscopy as a method to determine the depth distribution of trace elements - Pabst W. - Inst. Festkorpertechnol., Fraunhofer Ges., Munchen - NUCLINSTRUM.METH. 1975 124/1 (143-147)

The possibilities of determining the depth distribution of an element by ion induced X ray spectroscopy by means of measurements at several target orientations, are investigated. The variation of X ray yield with target orientation is calculated for some given profiles. The shape of these curves is compared with experimental results. It is shown that a Gaussian concentration profile can be located, but that the shape of the profile is not well resolved.

3290. Compact foreign made dental X ray generators: an evaluation of their acceptability for effective dental radiography. II. Image characteristics and observer performance - Saulnier V.E. and Barr J.H. - Dept. Oral Hlth Serv., Tufts Univ., Boston, Mass. 02111 - ORAL SURG. 1975 39/1 (158-173)

Imported generators, while inexpensive and compact, feature fixed peak kilovoltage and fixed milliamperage levels. These generators, because of the relative inflexibility of their operating characteristics, cannot be modified to produce radiographic image characteristics of equal diagnostic value to the domestic generators without compromises which are unacceptable.

6.18. Anesthesia

3291. Overdistention of the rebreathing bag, a hazardous test for circle system integrity - Debban D.G. and Bedford R.F. - Anesth. Operat. Serv., Walson Army Hosp., Ft. Dix, N.J. 08640 - ANESTHESIOLOGY 1975 42/3 (365-366)

Good anesthetic practice demands that an anesthesia circle absorber system be checked for leaks and proper valve function prior to use. One method of testing involves occluding the face mask outlet, closing the pop off valve, and filling the circuit with oxygen from the flush valve. An intact circuit will distend the rebreathing bag and maintain a constant reading on a pressure manometer. The quantity of soda lime remaining in the inspiratory tubing after this testing maneuver, was measured. At 10 cm H₂O, a minimal flow of gas was created and only 3 mg soda lime entered the inspiratory tubing. At 20 cm H₂O, there was considerably more flow, but only 10 mg soda lime was measured in the tubing. At 30 cm H₂O, a rapid flow of gas that caused 46 mg soda lime to lodge in the inspiratory hose was created. Distending the rebreathing bag to 40 cm H₂O resulted in an explosive rush of gas and soda lime particles, depositing 181 mg CO₂ absorbent in the inspiratory limb. It was not possible to distend the rebreathing bag to more than 42 cm H₂O pressure.

3292. Narcose a distance for pneumoencephalography using the X ray apparatus neurocentrix - NARCOSE A DISTANCE BEI DEM ROENTGENERATOR NEUROCENTRIX FÜR DIE PNEUMOENZEPHALOGRAPHIE - Alder A. and Guentert W. - Anasth. Abt. Kantonsspit., Aarau - ANAESTHESIST (Berl.) 1975 24/4 (185-188)

A method of anesthesia for pneumoencephalography patients in combination with a modern automated X ray apparatus is presented, including the technical details. The method was used in 62 patients.

6.19. Monitoring

3293. Methods for recording the continuous fetal heart rate and uterine contractions - Serr D.M. - Sect. Obstet. Gynecol., Univ. Med. Sch., Tel Aviv - CLIN. OBSTET. GYNAECOL. 1974 1/1 (169-190)

Increasing interest is being paid to the application of monitoring systems in obstetrics since it was realised that listening to the fetal heart tones once every 15 or 20 min is inadequate in high risk pregnancies and often in normal labour as well. The challenge of adding an important parameter to the assessment of the fetal state before labour by interpretation of fetal heart recordings, inspired the development firstly of indirect fetal electrocardiography and phonocardiography, and later of ultrasonic rate metering systems. The most important clinical application of electronic methods, which supplement, assist and in fact supersede the physical ability to evaluate the state of labour at a given time, has been in the combined systems

for continuous recording of the fetal heart rate and of uterine contractions during active labour. Direct or indirect methods, invasive and non invasive techniques need to be classified, and any particular obstetric unit will wisely weight the advantages to patient and staff before deciding which type to introduce or to add to its own existing equipment.

7. SURGICAL INSTRUMENTS

3294. Possibility of applying a circular suture on the portal vein with the aid of a modified version of suturing apparatus ALSh 20 (Russian) - Kulish N.I. - Kaf. Operat. Khir. Topograf. Anat., Med. Inst., Donetsk - EKSPER.KHIRANESTESIOL. 1974 19/6 (49-51)

For placing a primary circular suture on the portal vein an apparatus for linear stitching (type ALSh 20) was tested. A modification consisting in removing an over running through facilitated bringing its suturing part as near as possible to the operated vessel. Experimental studies were performed on 25 animals. In all the cases the portal vein proved patent, the suture line was even, and there was no thrombosing. Some complications related to the stitching apparatus itself and to the new method used are described. In connection with complications preventive measures are proposed.

3295. A simple technique for reducing laser cross section - Mathur S.S. and Bahuguna R.D. - Dept. Phys., Indian Inst. Technol., New Delhi - ATI FOND.G.RONCHI (Firenze) 1974 29/6 (921-926)

The cross section of a collimated beam of monochromatic light can be easily altered by using a pair of lenses. The disadvantage of using such a system is that defects due to spherical aberration astigmatism etc. cannot be completely removed. The authors describe an optical assembly for reducing the cross section of the beam without introducing any aberration.

3296. Extrusion of transtympanic ventilating tubes, relative to the site of insertion - Van Baarle P.W.L. and Wentges R.Th. - Univ. ENT Dept., St. Radboudziekenh., Nijmegen - ORL 1975 37/1 (35-40)

The results are presented of a study, designed to examine the relation between the site of insertion of transtympanic ventilating tubes into the tympanic membrane and the period elapsing before extrusion takes place. The results suggest that tubes inserted into the anterior part of the tympanic membrane remain in place for a longer period than tubes inserted posteriorly.

3297. A new finger tip controlled bipolar forceps for electrocoagulation - Rosenberg V.I. - Dept. Surg., Mt Sinai Sch. Med., City Univ., New York, N.Y. - PLAST.RECONSTR.SURG. (Baltimore) 1974 54/2 (228)

A new type of bipolar forceps for electrocoagulation was designed with the Bicomeric fingertip switch, which is located in between the 2 limbs of the forceps. The forceps are activated when the tips come into contact with each other. Only the tissue between the 2

points of the forceps is coagulated.

3298. A new instrument for the sclerotherapy of the esophageal wall in the treatment of acute hemorrhage from esophageal varices and of varices in the bleeding free interval - EIN NEUES INSTRUMENT ZUR WANDSKLEROSEIERUNG DER SPEISEROHRE BEI DER BEHANDLUNG DER AKUTEN OESOPHAGUSVARIZENBLUTUNG BZW. VON VARIZEN IM BLUTUNGSFREIEN INTERVALL - Paquet K.J. - Chir. Univ. Klin., Bonn - AKTUEL.GASTROL 1975 4/1 (41-42)

Over the past 5 yr sclerotherapy of the esophageal wall has proved to be successful in the treatment of acute hemorrhage from esophageal varices and of varices in the bleeding free interval. This procedure can be employed fairly easily by using a special rigid esophagoscope. As essential parts, it contains a suction device and in its therapeutic part a Hopkins lens and a needle on the tip connected to a spring at the base of the esophagoscope. As comparative tests showed it is definitely superior to a flexible endoscope. With increasing interest serial production is planned.

3299. New technique in varicose vein surgery with vein cutter - Wilson R.S. and Wallace F.T. - Dept. Surg., Wallace Wilson Brailsford Clin., Spartanburg, S.C. - BOLASOC.MED.P.R. 1974 66/12 (247-249)

Experience with surgical management of patients with varicose veins in the Wallace Wilson Brailsford Clinic indicates that management is a demanding but gratifying one if it is carried out in a single operative procedure. The procedure of choice is ligation and stripping of the varicose veins with complete removal of the entire superficial system. The procedure includes ligation of the greater saphenous vein at its junction with the femoral vein, ligation of its main branches at the groin, removal of the vein by stripping from the ankle to the groin with passing of an intra luminal guide then transecting the vein by an external cutter. Additional transverse incisions are made over the incompetent communicating tributaries. These tributaries are dissected out and are ligated with direct excision. The Thompson Wallace Wilson vein cutter was used with good results in the last 911 extremities of 1186 varicose vein operations.

3300. The Department of Medical Electronics, St. Bartholomew's Hospital: the first ten years - Watson B.W. - Dept. Med. Electron., St Bartholomew's Hosp., London - BIO-MED.ENGINEERING (Lond) 1975 10/3 (98-104)

The organisation of an electronics department required to support the work of a large teaching hospital is described. The research and development programme involves the interaction of graduates from many disciplines since problems can emerge from any of the specialities, for example general surgery, obstetrics and gynaecology, clinical neurophysiology. Examples from the research and development programme of the department are described in order to illustrate the range of medical electronic techniques needed to provide adequate support for the clinical research programmes which have received support from

the Joint Research Board of the Hospital and Medical College.

3301. A colostomy/ileostomy construction clamp - Tinckler L. - Maelor Gen. Hosp., Wrexham - BRIT.J.SURG. 1975 62/3 (246)

An atraumatic handleless clamp is described with which it has been found simpler to construct a terminal ileostomy or colostomy than with other forms of clamp in general use. The blades are Atraugrip and consequently hold the bowel without destroying its wall; no bowel therefore has to be excised after using the clamp as it remains viable. The clamp is 7.5 cm long; one blade bears a ratchet grasp swivelled at one end and is controlled by a strip of spring steel. It is box jointed. In use the clamp is applied across the segment of bowel destined to form the colostomy or ileostomy. The clamp is applied to the bowel so that the Atraugrip jaws bear on the mesenteric and antimesenteric aspects of the bowel wall. The blades are approximated with finger and thumb pressure and held in the closed position by one blade engaging in the ratchet grasp hinged on the other blade. Having accomplished its purpose the clamp is removed by disengaging the ratchet, thus freeing the blades.

3302. A new operating table - Grundman A.O. - BIOMED.ENGINEERING (N.Y.) 1975 8/4 (254-255)

The operating table with removable panels has a base built into the floor, and a pedestal of rectangular cross section. A frame for attachment of the removable panel is mounted on the movable part of the pedestal. Hydraulic cylinders for the power system of the table are mounted inside the pedestal and in the frame. The motive power is provided by a hydraulic system including a pump unit (electric and pedal operated), a pneumohydroaccumulator, a compressor, and distribution valves. The hydraulic system is located outside the operating theatre, and is connected to the pedestal of the table by water and air ducts concealed in the floor. If no electric power is available, the table can be controlled directly from the panel of the hydraulic system. The advantages of the new operating table compared with existing models are freer access to the patient because of the absence of control pedals and handles projecting beyond the table itself, the noiseless change of the position of the table, reduced electrical and explosion risks because of the absence of electric wires leading to the table, its remote control feature, the possibility of carrying out fluoroscopy and roentgenography over the whole length of the panel of the table, the possibility of controlling the speed of movement of all the driving components of the table, the availability of panels adapted for special branches of surgery, the possibility of transporting the patient on a trolley together with the table panel into and out of the operating theatre, facilities for using the vacuum and excess pressure supplied to the table pedestal, and the ease of cleaning and disinfecting the table.

9. COMPUTER APPLICATIONS

3303. Basic principles for the creation of a national automated system for permanent loss of working capacity - Peevsky T.D., Gloutnikova Z.N. and Nicholova V.I. - Inst. Soc. Hyg. Publ. Hlth, Sofia - METH.INFORM.MED. 1975 14/1 (29-31)

The system for the Observation and Analysis of Disability is part of the United National System for Health Service in Bulgaria. The system was designed after a detailed analysis of the incoming documents and their circulation had been performed and after various models had been designed and tested. Some of the basic tables describing the output of the system are shown. The information from these tables is designed for the various levels of administration which are the carriers of social activities in the country and for the management of the Boards of Experts on Industrial Medicine.

3304. Optical scanning for large scale studies - Schach E. - Rechenzent., Univ. Dortmund - METH.INFORM.MED. 1975 14/1 (32-34)

Data reporting the experience with an optical mark page reader is presented (IBM 1231 N 1). Information from 52,000 persons was gathered in seven countries, decentrally coded and centrally processed. Reader performance rates (i.e. sheets read per hr, sheet rejection rates, reading error rates) and costs (coding, verification, reading, etc.) are given.

3305. A computerized system for the selection of organ transplant recipients - Stulting R.D. and Ward F.E. - Southeast. Reg. Organ Procurement Program, Hlth Scis Cent., Med. Coll. Virginia, Richmond, Va. 23219 - TRANSPLANTATION 1975 19/1 (27-35)

The Southeastern Regional Organ Procurement Program developed a computerized system for the selection of organ transplant recipients. This system proved to be a useful method for the rapid selection of histocompatible recipients for organ transplants from a large pool of potential recipients in a wide geographical area. In addition, the system provides a readily accessible source of data that can be used to analyze the relationship between histocompatibility and transplant survival.

3306. DARE P: a portable CSSL type simulation language - Lucas J.J. and Wait J.V. - Dept. Computer Sci., Univ. Arizona, Tucson, Ariz. 85721 - SIMULATION 1975 24/1 (17-28)

This paper describes a batch mode Fortran based continuous system simulation language that retains the features of the Dare family of languages but is structured to facilitate implementation on a wide variety of computer systems. Except for a small set of necessarily system dependent routines (for character packing and unpacking, job abortion, etc.) the system is coded entirely in Fortran IV. It is highly modular, and uses system independent Fortran based methods for writing and manipulating solution files on mass storage. In Dare P problem equations are entered in a form close to ordinary mathematical notation; the associated procedural language is Fortran. User chosen variable names

in the problem description are accommodated by a special translator overlay which translates Dare problem statements into Fortran IV subprograms and builds a communication file. Run time data is entered via free form data cards. A variety of output options are provided, including line printer listings and plots, and CalComp plotter displays.

9.1. Hospital automation

3307. A token economy with 'automated' data collection - Tanner B.A., Parrino J.J. and Daniels A.C. - Georgia Reg. Hosp., Atlanta, Ga. - BEHAV.THER. 1975 6/1 (111-118)

A description is provided of a hospital wide token economy using tokens punched through cards and computer assisted data collection.

9.1.1. Laboratory techniques

3308. Statistical analysis of a series of experiments and of investigations by the aid of a computer - STATISTISCHE AUSWERTUNG VON VERSUCHSREIHEN UND REIHENUNTERSUCHUNGEN MIT HILFE DER ELEKTRONISCHEN DATENVERARBEITUNG - Helb H.D. and Helb H.W. - Fachbereich Biol., Univ. Kaiserslautern - FORMA FUNCTIO 1974 7/3 (241-247)

A fortran IV program is described in which the data of various test series can be analysed statistically. The program is based upon the supposition that the data of one particular test are independent from those of other tests within the series. The data belonging to one particular test may depend upon each other in any optional or unknown manner. The program permits this relation to be investigated by counting how often a given test data (parameter X) depending upon the amount of other test data (parameter A(i)) assumes a certain value. The program was designed for the analysis of a series of experiments on Willow Warblers (Aves: Phylloscopus t. trochilus) emphasizing ethological and bioacoustical questions. After adaptation to the character of data in other sciences the program can be used there for investigations of test series and serial experiments as well.

3309. The bactlab system. A data system for bacteriological routine - Bergqvist F. and Bengtsson S. - Uppsala Univ. Data Cent., Univ. Uppsala - COMPUT.PROGR.BIOMED. (Amst.) 1975 4/3 (144-157)

An implemented version of a data system for routine bacteriology is described which uses punch cards to record all administrative data and OMR (optical mark recognition) documents for the bacteriological findings: diagnosis, antibiotic sensitivity patterns, phage type etc. The output includes reports for the customers and report lists for the laboratory, as well as surveys over findings of pertinent bacteria produced twice each month. In addition, bills are produced at regular intervals, both for hospitals and for private patients. All results are stored on magnetic tape in order to enable analysis. The system has also been adapted for use in a

research project for the study of postoperative infections.

3310. Design of a computer program for off line processing of gas chromatographic data - Van Rijswick M.H.J. - PHILIPS RES.REP.SUP. 1975 29/7 (1-81)

The computer program for extraction of the information in a chromatogram is developed with design goals: low detection limits, optimum accuracy and precision of peak parameter estimates, and automatic setting of processing controls. The processing is divided in 3 steps, viz. inspection, detection and estimation. Matched filter detection is applied and pertinent detection limits are evaluated. The baseline is approximated by piecemeal polynomial functions. Single peaks are characterized by the moments and the location of the peak maximum. Overlapping peaks are separated by curve fitting; the peak model is dynamically adjusted. Expressions for the errors in the parameter values are derived for Gaussian peaks and white noise. The performance equals the best methods known so far, but the long processing time limits the application to non routine analyses; simplifications are suggested. For the identification by comparison of measured retention values with tabulated values a probabilistic matching criterion is applied. Prediction of retention values based on structural increments is demonstrated for alkanes.

9.1.3. Pharmacy

3311. An integrated data system for the retail pharmaceutical service - Preece J.F., Hunt N.A. and Skinner N.J. - Exeter Hlth Serv. Computer Project, Exeter - INT.J.BIOMED.COMPUT. 1975 6/1 (41-48)

A machine, designed for use in a retail pharmacy, counts tablets and records the count beside a machine read bar code, indicating the identity of the drug. Such data could be used for retail stock control and passed on for use by wholesaler, manufacturer and prescription pricing bureau for their routine processes. Thus, present processes would be greatly simplified, and some other advantages gained.

9.3. Clinical diagnosis

3312. Differential diagnosis of variants of acute leukemia by computer - Klyuchko E.V., Gluzman D.F., Barsuk Ya.I. et al. - Inst. Probl. Oncol., Acad. Ukrain. SSR, Kiev - DOKL.BIOLSCI. 1974 215/1-6 (99-101)

A computer program for differential diagnosis of the different forms of acute leukemia in terms of morphological and cytochemical features is described. The shape and size of blast cells, the nuclear cytoplasmic ratio, the presence or absence of granules in the cytoplasm, and the presence of erythroblasts were used as morphological criteria. The results of the response to peroxidase and to lipids (positive or negative response) glycogen (diffuse stain, finely granular

or coarsely clumped), non specific esterase (weak or moderate activity, acid and alkaline RNAase, acid and neutral DNAase, and non specific 5' exonuclease (weak moderate, or strong response) were used as cytochemical features of leukemic cells. The comparative study of 48 cases of acute leukemia in terms of morphological and cytochemical signs showed 6 forms of acute leukemia. These 6 forms corresponded to: myeloblastic (I), myelomonocytic (II), lymphoblastic (III), cellularly undifferentiated (IV), histomonoblastic (V) variants, and to erythromyelosis (VI). The number of distinguishable forms was greater than expected from a study of cytological and morphological characteristics of cells, without account being taken of responses to ribonucleases, desoxyribonucleases, and nonspecific exonuclease. It seemed that the cytochemical reactions normally used in tests for glycogen, lipids, peroxidase and non specific esterase do not reveal the histomonoblastic type of acute leukemia, though it is identified by the additional nuclease reaction. Furthermore, these cytochemical reactions do not always reveal the differences between myeloblastic and myelomonocytic forms of the disease.

3313. CEDI: a computer program for differential diagnosis of organic brain lesions - CEDI: EIN COMPUTERPROGRAMM ZUR PRAEOPERATIVEN ARTDIAGNOSTIK HIRNORGANISCHER PROZESSE - Virnich H., Kolberg T. and Winkler C. - Inst. Klin. Exp. Nucl. Med., Univ. Bonn - METH.INFORM.MED. 1975 14/1 (19-25)

A computer programme for differential diagnostics of organic brain lesions is described. The programme is based on Bayes Theorem, which was slightly modified. By means of the model used, interdependences of signs and symptoms can be explicitly taken into account. Because of the fact that all attributes of the programme concerning its specific diagnostic application can be predetermined by a master deck, the programme is most adaptable to different scopes. Additional programmes serve for supplementary statistical canvassing of the symptom's incidences and for passing back the information gained to the incidence matrices. Since these matrices supply the foundation for the calculation of probabilities of diagnoses, the programme has a learning structure owing to permanently accumulating information.

3314. Simplified computer aided diagnosis of acute abdominal pain - Wilson P.D., Horrocks J.C., Lyndon P.J. et al. - Univ. Dept. Surg., Gen. Infirmary, Leeds - BRIT.MED.J. 1975 2/5962 (73-75)

A simplified version of a system for computer aided diagnosis of acute abdominal pain was tested by new personnel unfamiliar with the previous system. After a 2 mth learning period, the system proved more accurate in its diagnosis than the unaided clinician, and during the first 5 mth of using the system, the unaided clinicians' accuracy rose from 73% to 84%. When computer feedback was withdrawn, the clinicians' diagnostic accuracy reverted to the previous, 'unaided' level. These findings further validate the use of the computer as a potentially valuable diagnostic aid, but indicate that a training period

and computer feedback are important factors in its use.

3315. Pattern recognition applied to surgery -
Patrick E.A., Stelmack F., Panda D.P. and Jardina S. - Sch. Electr. Engin., Purdue Univ., West Lafayette, Ind. 47907 - COMPUT.BIOL.MED. 1975 4/3-4 (293-300)

Features in a feature vector are defined in the conventional pattern recognition manner, but classes are defined interactively by the user, as regions in the feature vector space. By storing training samples, where a sample is a feature vector, the class conditional probability density is estimated. The procedure is applied to surgical patient features, the features corresponding to the kind of operation, diagnosis, patient's age, patients sex, etc. A class is then a patient in a specific age group, of a specific sex, and with a specific diagnosis. The procedure is useful for determining numbers of particular kinds of operations and diagnoses, numbers of particular kinds of operations performed by a certain physician, etc.

3316. The use of computer based diaries for the assessment of subjective symptomatology -
Tippett L.O., Zeleznick L.D. and Knowles W.E. - Alcon Lab. Incorp., Fort Worth, Tex. 76101 - METH.INFORM.MED. 1975 14/2 (62-68)

Better methods are needed to evaluate the therapy of diseases which are subject to frequent fluctuation in the intensity of symptoms and lack an objective measurement reflecting the disease state. A patient diary system is reported, in which patient symptomatology is collected and the data computerized. The system provides for management and automated tabulation of large volumes of data. It proved to be a successful way to obtain the detailed symptomatological data necessary to assess therapeutic regimens in hay fever clinical studies.

9.4. Electrodiagnosis

9.4.1. Electrocardiography

3317. Stochastic operations on CCU electrocardiograms - Swenne C.A. and Looyen J.C. - PROG.REP.MED.FYS.INST.TNO 1974 no. 4 (188-192)

When analyzing electrocardiograms, one is always confronted with the problem of the detection of ventricular (QRS) complexes. In this contribution, a method for optimizing the detection parameters of such a detector intended for operation in a coronary care unit is described. Optimization is done with 2 populations, each consisting of 54 different patterns; the results for these 2 populations are compared. The aim of this method is to find criteria for a good working detector which can be used in a coronary care unit.

3318. Software QRS wave detection of VCGs and ECGs - Pronk R.A.F. - St Antonius Hosp., Utrecht - PROG.REP.MED.FYS.INST.TNO 1974 no. 4 (202-205)

A computer program was written for the determination of reference points in QRS waves

of vectorcardiograms and electrocardiograms. The lead systems employed were the Frank lead system and the standard 12 lead system. The program was applied to lead groups of 3 simultaneously recorded leads. The results can be used for contour classification as well as for rhythm diagnosis of electrocardiograms.

3319. Analysis of the cardiac rhythm structure in atrial fibrillation made with the aid of a specialized computer (Russian) - Nedostup A.V., Bogdanova E.A. and Mikhnovsky E.I. - Kaf. Fak. Ter., I Med. Inst., Moscow - KARDIOLOGIYA 1975 15/1 (64-69)

In 34 patients with atrial fibrillation of varying etiology, the electronic computer technique was used in recording the cardiointervalogram and interval histogram and also in determining a number of indices characterizing the features of the distribution of R R intervals. The cases showed a tendency towards the appearance of definite types of interval histograms, and variations in the mean level of the cardiointervalogram, resembling the so called slow waves observable in the sinus rhythm. During repeated investigations made in the same patients, constancy of the features of the distribution of the R R intervals was apparent. In the course of conservative therapy of atrial fibrillation a certain stereotypy in the distribution of the R R intervals was noted, being indicative of an increased arrhythmicity in the work of the heart occurring simultaneously with the slowing of the cardiac contractions.

3320. Computerized ECG and community practice. A note of caution - Riley C.P. and Langhorne W.H. - 14 West Jordan St., Pensacola, Fla. 32501 - J.FLA MEDASS 1975 62/3 (19-23)

A case of myocardial infarction is presented that illustrates both an error in clinical judgment and in computer interpretation of the electrocardiogram. Review of serial tracings and confidence in the initial clinical impression would have established the correct diagnosis. The busy practitioner without training or confidence in ECG interpretation may become too dependent on the computer for a medical diagnosis. The deficiencies of computer programs in the diagnosis of complex arrhythmias as well as the lack of routine comparison of ECGs should be emphasized to the physician who has been influenced to use this system. Continued physician education and his awareness of the present state of computer reliability may alleviate this problem.

3321. An algorithm for on line, real time computer detection of ECG changes - Burton C.E., Portnoy W.M. and Dirlit H. - Dept. Instrumentat. Res., Southwest Res. Inst., San Antonio, Tex. - INT.J.BIOMED.COMPUT. 1975 6/1 (23-32)

An algorithm for detection of ECG changes based on the Fourier transform is presented. The realisation of the algorithm was programmed on a minicomputer and could detect both large and subtle changes in an ECG waveform. The cardiac arrhythmias used in the study included normal sinus rhythm, premature atrial contraction, premature ventricle contraction, first, second and

third degree blocks, atrial and ventricular fibrillation and ventricular tachycardia. The algorithm was used to detect rhythm changes, but it is possible that, using it, a unique specification for a waveform at any frequency could be obtained.

3322. Electrocardiographic screening by special purpose computer. Correlation with twelve lead electrocardiogram - De Carvalho A.G. - Cardiovasc. Dept., St John's Hosp., Springfield, Ill. 62701 - J.ELECTROCARDIOL. 1975 8/2 (163-166)

An electrocardiometer (ECM) which computes the T/R ratio of Lead I and simultaneously prints out Lead I was used to screen 1,004 consecutive hospitalized patients for ECG abnormalities. When the combined meter and Lead I print out analyses were used, 77.9% of abnormal ECG were identified with a false positive rate of less than 4%. The method was highly specific for detecting ECG abnormalities associated with anterior and lateral left ventricular disease. It is suggested that it could be used as an inexpensive mass screening device for electrocardiograph risk factors associated with coronary disease.

9.4.2. Electroencephalography

3323. EEG spectral analysis for nova computers - Huber F. - Cardiovasc. Pulmon. Res. Lab., Univ. Colorado Med. Cent., Denver, Colo. 80220 - COMPUT.PROGR.BIOMED. (Amst.) 1975 4/3 (175-179)

Two programs for the spectral analysis of EEG data are presented. Both are designed to be independent of any particular I/O environment. The implementation of the programs on different Nova configurations is therefore easily accomplished.

9.7. Radiotherapy

3324. Computer assisted thyroïdal technetium uptake measurement using a short pinhole to surface distance - Armstrong D.I., Rogers T.G.H. and Brownlie B.E.W. - Dept. Med. Phys., Christchurch Hosp., Christchurch - AMER.ROENTGENOL. 1975 123/1 (60-66)

The close pinhole view of the thyroid presents some important measurement problems. Possible errors due to gland, neck and setup geometry are accentuated due to the effects of the inverse square law, and care is needed to control these. The nonuniform response inherent in the use of the pinhole collimator has a significant effect, but with computer processing this is readily eliminated. Extrathyroidal neck radiation (ENR) subtraction may become difficult in certain circumstances, as insufficient 'background areas' may be viewed, but it has been shown that the use of a 'universal' (for the particular system) ENR subtraction may give, if anything, more accurate results. With these precautions in use, important errors will be of the same order of magnitude as those involved in more distant views, and may thus be kept within

the realms of clinical significance. On the other hand, considerable improvements in both resolution and sensitivity make the use of the closer view an asset to both the research laboratory and the small department involved mainly in routine service work.

3325. A data acquisition system for three dimensional treatment planning - Mantel J., Perry H. and Weinkam J.J. - Dept. Radiol., Abraham Anna Srere Radiat. Ther. Cent., Sinai Hosp., Detroit, Mich - RADIOLOGY 1975 115/1 (187-189)

The authors describe a coordinate measuring device developed to simplify manual acquisition of the digital information required for computerized 3 dimensional treatment planning. This system has been used for 2 yr and shown to be both fast and accurate. The time needed to digitize contour data is reduced to approximately one tenth of that required for manual methods in most cases.

3326. Development and comparison of computer methods for organ motion correction in scintigraphy - Schmidlin P. - Inst. Nucl. Med., German Cancer Res. Cent., Heidelberg - PHYS.MED.BIOL. 1975 20/3 (465-476)

The process of organ motion correction in scintigraphy is analysed in the frequency domain. The sequence of the x and y coordinates registered during scintigraphic recording is converted to a frequency spectrum by a discrete Fourier transform. In the frequency domain motion correction is performed by linear filtering. Every convolution filter in the time domain corresponds to a linear filter in the frequency domain, and the filter form in the frequency domain is a good measure of the quality of the correction. With the aid of frequency analysis simple convolution filters in the time domain are developed. The usual centre of gravity method is not a convolution filter and has an unfavourable frequency behaviour. By means of phantom measurements the following correction methods are tested: the usual (non convolutional) centre of gravity method, the convolutional centre of gravity method, a weighted convolutional centre of gravity method and the Fourier filtering method.

9.8. Medical record documentation

3327. The management of medical files by computer. Advantages and limitations - LA GESTION DU DOSSIER MEDICAL PAR ORDINATEUR - Kressmann J. - Hotel Dieu, Lyon - J.MED.LYON 1974 55/1278 (1361-1374)

The advantages of computer assisted management include: efficient data handling leading to improved patient care, nosology and etiopathogeny; technical solutions afford a differential use of computer assistance according to the specific needs of the physician and the data required. The disadvantages, the author concludes, are not inherent in the system adopted but depend for their importance on the (unreliable) human element.

9.9. Literature documentation

3328. Searching the MEDLARS citation file On-LINE using ELHILL 2 and STAIRS: a comparison - Humphrey S.M. - Nat. Library Med., Bethesda, Md. 20014 - INFORM.STOR.RETR. 1974 10/9-10 (321-329)

This article is a comparison of ELHILL 2 and STAIRS programs with respect to on line searching of the MEDLARS citation file. Areas under consideration are data base characteristics, basic terminal interactions, commands, search statements, and printing citations resulting from on line or off line processing.

9.10. Function tests and techniques

3329. Computer aided data processing for digestive endoscopy with the help of a code system - Dobronte Z., Nafradi J., Varro V. and Benedek Sz. - I Dept. Med., Computer Cent., Univ. Med. Sch., Szeged - ENDOSCOPY (Stuttg.) 1975 7/1 (1-5)

The authors elaborated a computerized description of endoscopic findings in the framework of a gastroenterological patient data documentation system now under development. A code symbol system and a computer programme were devised for the uniform documentation and computer processing of oesophago gastro duodenoscopic, laparoscopic and rectoscopic findings. The increased objectiveness of the examination findings raises their diagnostic potential and with the computerized reporting of the findings a possibility arises for the computerized scientific processing of the information content stored in the endoscopic findings. A brief account is given of the advantages of the general use of a uniform nomenclature for the findings.

3330. The usefulness of system analysis to reduce the anaesthetic risk - ANWENDBARKEIT DER SYSTEMANALYSE ZUR VERMINDERUNG DES NARKOSERISIKOS - Renkes Hegendoerfer U. - Anaesth. Abt., Stadt. Krankenanst., Duisburg - ANAESTHESIST (Berl.) 1975 24/4 (189-191)

Systems analysis would result in a certain levelling out of the demands made on the staff and the equipment of an anesthesiology department and help to build a bridge between doctors and their industrial supplies. Systems analysis rejects the examination of separate risk factors in order to study the system as a whole and the functional cohesion of the various elements within it. In anesthesia, there are three different systems to be studied: the induction phase, the phase of true anesthesia, the recovery phase. The induction phase is discussed in this paper as an example of the thought processes and steps involved in a study by means of systems analysis.

3331. Cine angiographic determination of ventricular volumes with the help of a computer - KINEANGIOGRAPHISCHE BESTIMMUNG VON VENTRIKELVOLUMINA MIT RECHNERHILFE - Kaltenbach M. and Schulz W. - Abt. Kardiol., Zent. Inn. Med., Klin., Univ. Frankfurt/M. - DTSCH.MED.WSCHR. 1975 100/12 (590-593)

A computerised method of determining ventricular volumes from cineangiograms in two planes was developed. The heart is divided into a large number of sections by computer analysis, the volumes being obtained from the corresponding diameters in the two planes. Using a computer markedly facilitates calculations and the results are immediately available. Data for ventricular and stroke volumes agree well with those reported in the literature.

3332. Computerized measurements of cardiac transmembrane potentials - D'Agrosa L.S. and Marlinghaus K. - St. Louis Univ. Sch. Med., St. Louis, Mo. 63104 - COMPUTERS BIOMED.RES. 1975 8/1 (97-104)

A computerized method for measuring cardiac transmembrane potential parameters as well as refractory periods in spontaneous or paced hearts is described. The system consists of standard microelectrode equipment for sampling single cardiac cells and a Digital Equipment Corporation LINC computer to collect, analyze and store the data. Immediate or future access to the parameters of a cardiac transmembrane potential (time, voltage, slope) from multiple samples is provided.

3333. Dynamic optimization of in series cardiac assistance by means of intra aortic balloon pumping - Min B., Welkowitz W., Fisch S. et al. - Electr. Engin. Dept., Rutgers Univ., New Brunswick, N.J. - BULL.MATH.BIOL. 1975 37/1 (19-35)

Analytical techniques are developed which permit objective control of assist device driving systems. In addition to being objective, the techniques described in this paper are optimal in the sense of minimizing a performance index which consists of a term involving left ventricular power and a term involving deviations of aorta hemodynamic parameters from normal values. Comparisons are included of off line computations and measurements on dogs with experimentally induced myocardial infarctions undergoing intraaortic balloon pumping.

3334. Computer graphics analysis of stresses in blood flow through a prosthetic heart valve - Au A.D. and Greenfield H.S. - Dept. Surg., Univ. Utah, Salt Lake City, Ut. 84112 - COMPUT.BIOL.MED. 1975 4/3-4 (279-291)

Fluid dynamics principles and numerical analysis techniques are applied to the study of stress distribution in blood, caused by the motion of the occluder in a prosthetic heart valve. An interactive computer graphics program is developed for the stimulation of the flow process and the pictorial presentation of the solution for analysis. Resulting graphics displays show the stress distribution and other flow parameters which describe the movement of a disc occluder

from full closed position to an almost full open position. The possible contributions of this study to the understanding of hemolysis and thrombosis associated with prosthetic heart valves are discussed.

3335. An on line system for measurement of opacity pulse propagation times in atraumatic screening of patients for occlusive vascular disease - Heck A.F. and Hall V.R. - Dept. Neurol., Univ. Maryland Sch. Med., Baltimore, Md. 21201 - MED.INSTRUMENT. 1975 9/2 (88-92)

Measurements of opacity pulse propagation times to internal and external carotid vascular beds of the face, and to upper extremities on either side of the body is a useful atraumatic method of screening patients for extracranial cerebrovascular disease. A system is described for rapid measurement and on line presentation of pulse propagation times, that improves upon factors of measurement accuracy and time required to perform the procedure, that had previously limited the clinical application of the method. Pulse propagation measurements evaluating common carotid, internal carotid, external carotid, and subclavian arteries can be carried out, and results obtained in 10 to 15 min, using this system. Correlations of data obtained with the system with results of 4 vessels angiography in patients are presented.

3336. Computer analysis of on line signals with respect to dog blood pressure - DEPOUILLEMENT DE SIGNAUX ON LINE RELATIFS A LA PRESSION SANGUINE CHEZ LE CHIEN - Gervois J.P. and Dinh B.K. - Cent. Rech. Clin Midy, Montpellier - THERAPIE 1975 30/1 (75-81)

An attempt to use computer analysis to screen for new cardiovascular drugs is described. The method makes use of a computer to measure the mediator induced variations in blood pressure. Analysis is based on sampling of blood pressure and respiration signals, isolation of the different systoles and calculation of variations from the average blood pressure under the same respiratory conditions. This procedure can serve as a basis for systematic analysis of blood pressure curves.

3337. Computer programmes for stereotactic neurosurgery - Birg W. and Mundinger F. - Neurosurg. Univ. Hosp., Univ. Freiburg - CONF.NEUROL. (Basel) 1974 36/4-6 (326-333)

In improving the execution of the operational procedure for stereotactic technique 2 factors were critical: firstly, through the elimination of multilocular targets in one session indications for stereotactic brain operations could be extended; secondly, interest lay in extending indications even to include older patients who could not or could no longer withstand the stress of such an operation performed according to the earlier procedure. For these reasons the authors were inclined to employ computer calculations in the operational procedure for the technique of the stereotactic apparatus itself, for localizing the target, and for varying this target. They thus modified the second model of the Riechert and Mundinger stereotactic apparatus, which dates back to 1951, so that the adjustment parameters

for each target may be calculated by computer. In order to carry out the calculations of the adjustment parameters, it was necessary to consider the principle on which this apparatus is constructed. In order to visualize the track of the probe in reference to the anatomical structures, the authors introduced brain cross sections into the computer program, following the work done by Thompson and Bertrand. The authors disposed of an alternative program which permitted them to make immediate changes of the target, should this prove necessary intraoperatively on the basis of electrophysiologic examinations.

9.10.3. Nervous system

3338. The use of a small computer for the automatic control of operant behavioural experiments - UTILISATION D'UN MINI ORDINATEUR POUR LE CONTROLE AUTOMATIQUE D'EXPERIMENTATIONS DE CONDITIONNEMENT OPERANT - Hachet C. and Dantzer R. - INRA, Lab. Pharmacol. Toxicol., Toulouse - J.PHYSIOL. (Paris) 1974 68/6 (705-710)

A simple and inexpensive method of interfacing a small computer with conditioning chambers is described. It allows on line control of several conditioning experiments, as well as recording and possible analysis of results.

3339. An open loop control of a stereotactic device - HALBAUTOMATISCHE ELEKTRONISCHE STEUERUNG EINES MIKROELEKTRODEN VORTRIEBES - Meyer Waarden K., Lange D. and May H.U. - Inst. Biokybernet. Biomed. Techn., Univ. Karlsruhe - BIOMED.TECHN. 1975 20/2 (71-75)

The measurement of action potentials in the brain is a very time consuming procedure. This paper describes an apparatus for the semi automatic control of the vertical movements of a microelectrode by a stereotactic device. The movement of the microelectrode consists of a fast phase to find the area to be investigated, followed by a slow phase to seek out the action potentials. A special electronic circuit stops the slow movement of the stereotactic device when any particular impulse is detected. The impulses are analysed and the recorder electronics cut in when spikes are recognized. The criteria for action pulse recognition are: frequency content, pulse width, number of pulses per unit of time. If all the criteria are met, the impulses are accepted as action potentials and the registration of the signals is triggered. If the criteria are not met, the seeking out process is continued.



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 700 Darian Smith I.
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 4 Das M.B.
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 512 Das S.K.
 36 Dasarathy B.V.
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 727 De Sterke J.A.
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 1289 De Vernejoul P.
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 277 DeLara M.
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 2362 Deakin M.A.B.
 2631 Deakin M.A.B.
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 46 Denier Van Der Gon J.J.
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1291 Deutsch M.	360 Dosman J.	2910 Dyer J.A.
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2693 Devendran T.	259 Dotevall G.	12 Dyson A.F.
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2327 Dewhurst D.J.	2497 Douglass R.W.	
2741 Dewis I.G.	2774 Douma F.	468 Eagles J.P.
3124 Dhez P.	376 Doutriaux J.	1020 Earil J.M.
2340 Di Chiro G.	1868 Dovgopol S.P.	666 Ebara T.
1584 Di Paola R.	524 Dow R.J.F.	2662 Ebata M.
978 Di Simoni F.G.	740 Dower G.E.	1901 Eberhardt G.
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964 DiCaprio R.A.	3227 Doyle D.J.	1505 Echallier J.F.
2103 DiCaprio R.A.	1944 Doyle P.T.	687 Eckel K.
901 DiCenzo C.D.	2547 Dragiev T.	1711 Ecker F.
2004 Diamond H.S.	1031 Dragsten P.R.	1589 Ecker W.
2926 Diamond H.S.	1555 Dratler J. Jr	1963 Eckert H.
1748 Diamond P.	739 Dreifus L.S.	846 Eckhardt R.
2823 Diamond P.	1431 Dreifus L.S.	1491 Eckhorn R.
312 Dick D.E.	391 Dreitlein J.	1765 Eckhorn R.
169 Dickson D.J.	1045 Drescher D.G.	282 Ector H.
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1653 Divenyi P.L.	1648 Ducker T.B.	2466 Edmonds C.J.
1077 Dix W.R.	1950 Ducker T.B.	1005 Edmunds Jr L.H.
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2321 Dixon P.N.	589 Dudeney A.W.L.	903 Edwards R.H.T.
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2860 Djupesland G.	2604 Duisterhout J.S.	2315 Egan J.J.
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2299 Doi K.	612 Dunn Jr W.R.	11 Eichner W.
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 151 Faulkner D.
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 698 Fay D.F.
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 2015 Feddema Gorissen A.
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 767 Fick G.
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 1521 Fokin V.K.
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 67 Fomin S.V.
 801 Fomin S.V.
 1721 Fomin S.V.
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 2950 Forbes G.B.
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 164 Forsyth N.
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 1029 Quinn S.A.
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3247 Reichardt W.	72 Riley J.C.	3324 Rogers T.G.H.
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2731 Reinhardt P.	1705 Ritsema Van Eck H.J.	309 Ronchi L.
3186 Reinhardt P.	1648 Rittenbury M.S.	680 Ronchi L.
2407 Reinish G.B.	1950 Rittenbury M.S.	799 Ronchi L.
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66 Renninger G.H.	2338 Robb R.A.	996 Rosborough J.
1911 Renou P.	2487 Robb R.A.	420 Rose J.L.
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1967 Rice E.	525 Robinson P.F.	511 Ross P.J.
588 Rice R.R.	1546 Robinson V.N.E.	73 Ross R.S.
789 Richards A.M.	3262 Robinson W.E.	1147 Ross S.M.
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643 Richardson P.J.	3179 Roche J.F.	305 Roth G.L.
427 Richardson S.	242 Rochester G.K.	2825 Roth J.G.
273 Richter G.	464 Rodden B.E.	87 Rothchild R.D.
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5 Suen C.Y.	1431 Talbot S.	1790 Thayse A.
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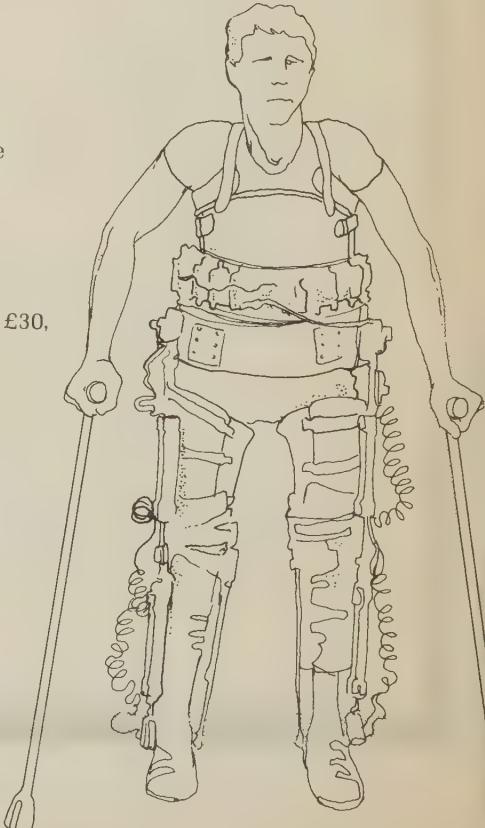
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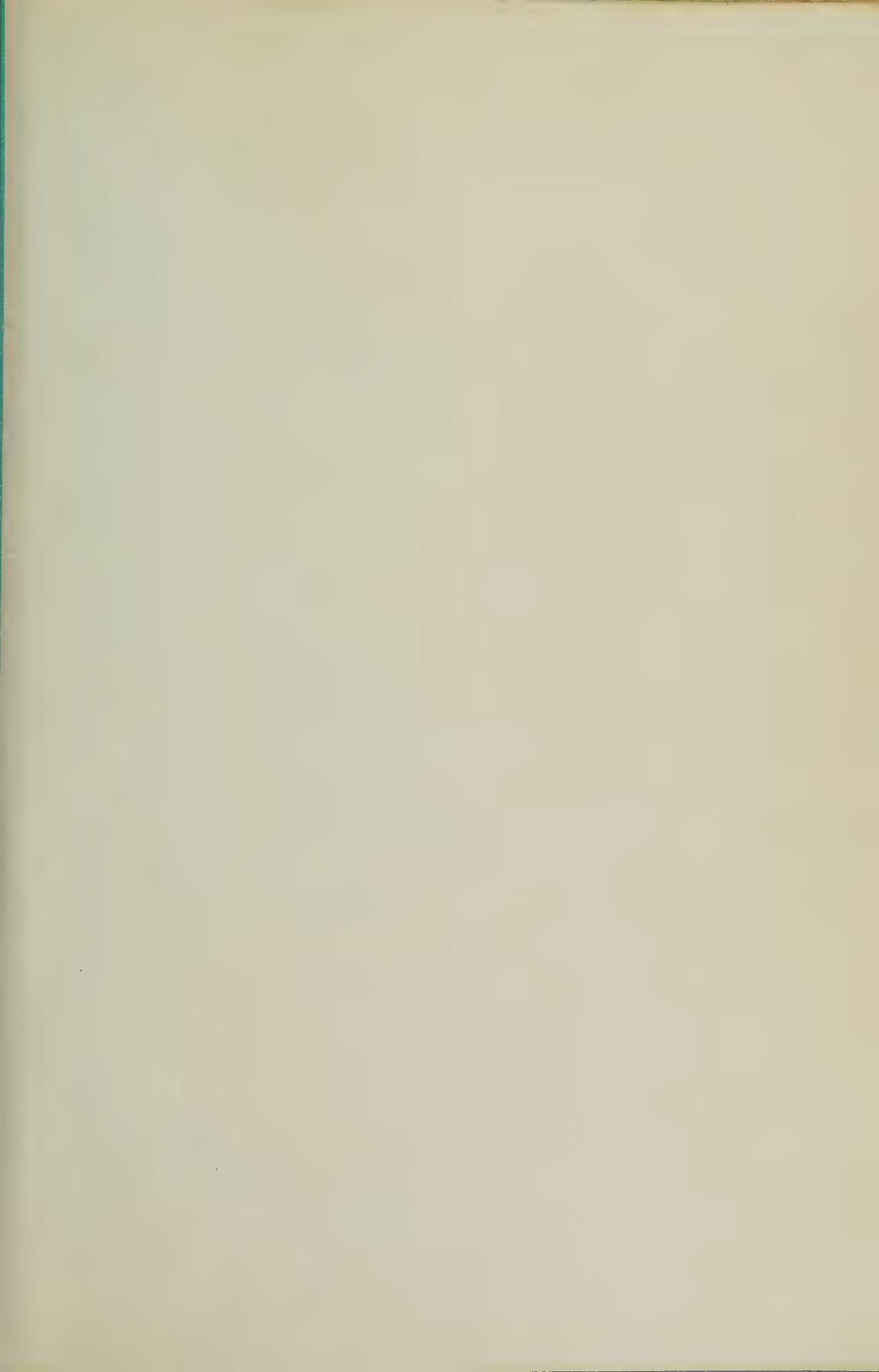


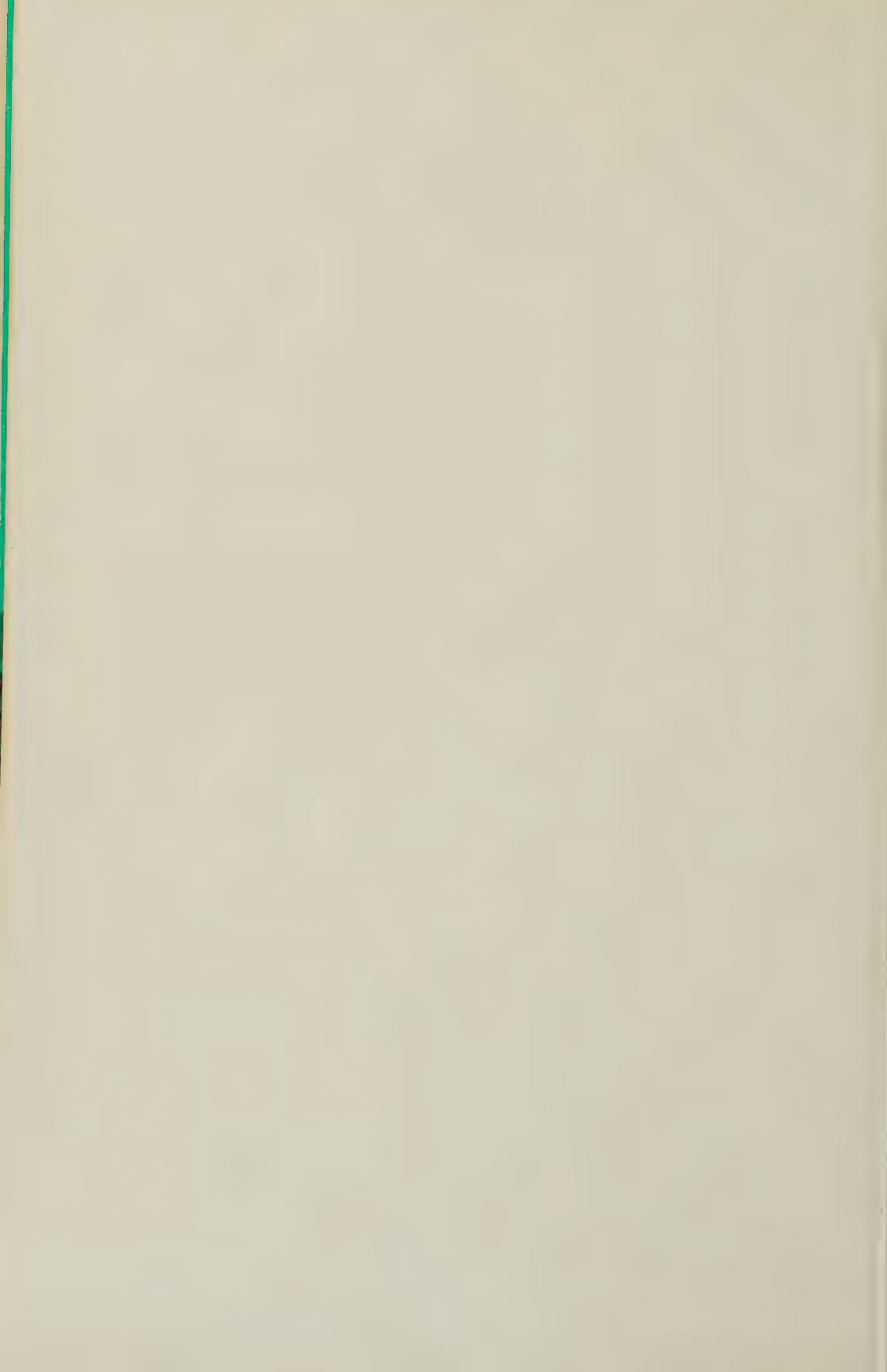
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